82D CONGRESS
2d Session

SENATE

REPORT
No. 1062

DEFENSE PRODUCTION ACT

PROGRESS REPORT NO. 15

ELECTRIC POWER STUDY

BY THE

JOINT COMMITTEE ON DEFENSE PRODUCTION
CONGRESS OF THE UNITED STATES

EIGHTY-SECOND CONGRESS
SECOND SESSION

JANUARY 15 (legislative day, JANUARY 10), 1952.—Ordered to be printed, with illustrations

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Mr. MAYBANK, from the Joint Committee on Defense Production, submitted the following

REPORT

PART 1. COMMITTEE DISCUSSIONS

THE PROBLEM

Shortly before the adjournment of the Congress in October 1951, your committee directed its staff to conduct a study of the electric power program in this country in order to determine its adequacy to support defense mobilization needs. In addition to data obtained from the agencies in the executive department administering various segments of this program, your committee received valuable information from State and Territorial regulatory commissions, local and regional associations and publishers interested in the electric-power industry, operating companies in the electric-utility field, and industries using electricity in defense work. The non-Federal groups chose to participate in this study as a voluntary matter upon invitation from your committee. It is the opinion of your committee that this approach to the problem has resulted in the collection of basic data enabling an objective study of electric power and its relationship to the defense program.

DISCUSSION OF PHASES OF PROBLEM

On the basis of material gathered from varied sources during its study of this problem, your committee proposes to summarize the following phases of the adequacy of the electric power supply for the needs of economic mobilization:

1. Present supply.
2. Outstanding requirements.
3. Ways to conserve power.
4. Easily identified bottlenecks.
5. Review of outlook.

PRESENT SUPPLY

All sources agree that the present supply of electric power cannot be relied upon as adequate to meet defense and civilian needs over the next 3 years. DEPA estimates total capacity available in 1951

at 74.5 million kilowatts. Edison Electric Institute places the figure at approximately 75 million kilowatts. In its January 1951 issue the trade journal Electrical World uses the same general figure for 1951 generating capacity. It is interesting to note by way of comparison that these figures exceed the forecast of 73.6 million kilowatts made by the National Security Resources Board in its Third National Electric Power Survey, published in April 1950.

These are statistics for Nation-wide capability and do not point up the areas of critical shortage, because electric power is not interchangeable among all areas. For example, during the past calendar year shortages have developed in such widespread areas as the Pacific Northwest, the Southeast, and the Pittsburgh, Pa., industrial area. Shortages also threatened in the Texas area. Defense production suffered as follows: 100,000 kilowatts of power for aluminum production was interrupted for almost 3 weeks in the Pacific Northwest. Aluminum production was also curtailed in North Carolina. In adjoining South Carolina, ferro-alloy production was reduced. Electric furnace operation was curtailed for several months in the Pittsburgh district.

All companies and agencies involved in the electric power industry had planned for expansion of capacity beyond the present supply. This action was in accord with the spirit of the recommendation made by the National Security Resources Board in its 1950 report that, since adequate capacity was then available to manufacture additional generating units and other power system equipment, power system executives and Government officials should take advantage of that open capacity to bring generating reserves and transmission ties to fully adequate levels.

OUTSTANDING REQUIREMENTS

In this matter again there seems to be general agreement from all sources that the requirements for electric power presently outstanding and foreseeable within the next few years are running a neck-and-neck race with capability. DEPA estimated the total capacity required in 1951 at 75 million kilowatts. Edison Electric Institute and Electrical World agreed with this estimate, on the basis of defense loads known at the time their estimates were made.

The figures on capability are deceptive at first glance, however, for they include an allowance which must be made for a minimum operating reserve, including maintenance and repair, emergency outages of equipment, and the regulation of load in transmission systems. This reserve is definitely not surplus power available for additional loads.

It should be obvious that these estimates of requirements must vary with a change in defense needs for electric power. At present it appears that this factor may cause an increase rather than a decrease in power requirement estimates. This factor must again be considered in terms of areas wherein the needs for power for defense purposes occur.

WAYS TO CONSERVE POWER

With current supply running so close to current demand for electric power, it becomes necessary to consider ways to conserve power. But a discouraging fact greets us at the outset. On the basis of past experience, only comparatively minor amounts of electric energy can

be saved by such means as curtailing domestic consumption and brown-outs of electric signs and municipal lighting. This is not to say that these are not necessary forms of conservation, for in a time of need every saving of electric energy helps. This type of conservation is discussed more fully in the DEPA portion of this report.

As noted in the recommendations of your committee, another form of conservation would be the invoking of a national system of daylight-saving time to reduce the peak load on power systems. Estimates of power saving possible from this move range from three-fourths of a million kilowatts to around 2 million kilowatts for the Nation. Again, this represents a small part of requirements ranging upward from 75 million kilowatts, although it is a course that may prove to be more desirable than the alternatives of brown-outs, cutbacks in industrial production, or using up scarce material, which would be useful elsewhere in the defense mobilization, to construct new power plants in order to produce an equivalent amount of kilowatts of electric power. DEPA notes that conservation through increasing nighttime operation of industry offers hope of only small savings of power. Unfortunately, sizable amounts of electricity in the past have been conserved only by cutting back industrial production. This leads to the necessity of establishing a priority system of national usefulness of industries in the area where the cut-back is to be made. Economic dislocations would be caused by increasing unemployment and business failures in a period when neither could be remedied in that area because of a lack of sufficient electric energy. Wholly apart from these troubles, it is an evil choice to be required to say which particular industries shall be allowed to continue to operate in these days when more and more the trend is toward a requirement for greater numbers of businesses to contribute needed production for the Nation's defense. Time was when a feudal knight went forth to battle with his own implements of warfare and was able to live off the land. That time has long since passed, and huge varieties of industries are now necessary to equip the fighting man with his weapons and provide his subsistence and also to sustain the defense workers, urban and rural, required to manufacture the equipment and produce the food.

Other portions of this report indicate no large supply of energy can be made available by additional interconnection of systems.

Since the foregoing appear to be either insufficient or undesirable to obtain the extra amounts of electric power needed, we must consider the only other method left—construction of new electric power plants—and make every effort to arrange for completion of these plants according to schedule.

EASILY IDENTIFIED BOTTLENECKS

Plans have been made to expand electric power production capacity. Many of these initiated before the outbreak of aggression in Korea are now in the process of being carried through to completion. Indeed the chart entitled "Typical Steam Power Plant Construction Schedule," attached to the DEPA portion of this report, indicates that nearly all new construction projects now under way were authorized long before war flamed in Korea on June 25, 1950.

A study of information submitted to your committee by utility operators and State commissions having jurisdiction over certain

phases of electric-utility operations leads to the conclusion that these people closely acquainted with electric-utility systems believe they have planned an adequate electric power expansion program.

We insert at this point a sampling of comments made by those concerned with these plans. (See also Report 3 for comments of national and regional associations, p. 55.)

COMMENTS OF UTILITY OPERATORS AND STATE COMMISSIONS

State of Alabama, Alabama Public Service Commission

It is our suggestion that the best way to prevent any deficiency in power supply in this State is for National Production Authority, based upon the recommendations of Defense Electric Power Administration, to assure highest priority assistance for allocation and delivery of steel, copper, aluminum, and other critical materials necessary to expedite the completion of power-generating, transmission, and other facilities required to meet the future power requirements as forecast by the utilities in this area.

State of Colorado Public Utilities Commission

Consequently, the scheduled capacity additions must be maintained in order that the area will not suffer a power shortage. In order to attain these schedules, it is absolutely essential that the manufacturers of electrical equipment and the power and light industry be allocated sufficient critical materials to carry forward their construction programs as outlined.

State of Connecticut Public Utilities Commission

In view of all these facts, this commission is strongly of the opinion that electric utilities must be able to secure without delays the necessary materials to build new plants and add to old plants if sufficient generating capacity is to be available to supply the needs of the defense and civilian economy. Therefore we urge that all appropriate steps be taken to accomplish this end.

State of Idaho Public Utilities Commission

Exhibit No. 10 discloses new construction for generating units and the dates on which it is necessary that they be placed in operation in order to maintain the margins shown in the exhibits. Delay in equipment delivery is probably the only factor which will prevent these units coming on the line as scheduled. Efforts are being made by these two companies at this time to schedule required additions for the year 1954–55. It must be borne in mind that equipment deliveries of this type require 2 to 3 years.

State of Mississippi, Mississippi Power Co.

Our suggestion toward preventing any deficiency in power supply in our company or the Southern Co. integrated system would be for the National Production Administration through its agency DEPA to assure proper priority assistance and allocation for delivery of steel, copper, aluminum, and other critical materials necessary to expedite the completion of power-generating and transmission facilities as planned and required to meet the future power requirements as forecast.

State of Montana Board of Railroad Commissioners (ex officio public-service commission)

It is essential that materials be made available in quantities and at times that will permit the expansion programs to move ahead.

No serious difficulties have arisen in this respect to date so far as the Montana Power Co. is concerned, but the need for prompt and efficient handling of utilities' requests cannot be overemphasized.

State of New York Public Service Commission

There is a large amount of generating equipment being manufactured or under order at the present time, and its completion and installation will depend upon the availability of the materials required which involve such essentials as copper and steel, subject to Federal priorities. The scheduled year of completion for the various units shown * * * might undergo revision because of these factors.

State of Ohio Public Utilities Commission

The present scheduled capacity installations of Ohio utilities are 1 to 4 months behind originally planned installation dates which could have been met except for

cuts in material allocations and slippage in manufacturers' schedules, due to rescheduling by governmental agencies or cuts in material allocations to both power companies and the manufacturers. Any further slippage of scheduled installations would create a serious power shortage in this important industrial area. Such a shortage of power would be seriously detrimental to the defense program because these utilities serve areas which are at the heart of the industrial section and defense production might of the country. * * *

Fundamental to the protection of needed defense production must be an awareness that the quickest, and materialwise the cheapest, way to insure adequate power supply is to see that the already planned power expansions in the industrial and defense production centers of the country get the materials and equipment needed and on time. Because of the strategic importance of Ohio in defense production, it is particularly necessary that there be no further slippage of planned capacity expansions here. Diversion of critical materials to power installations remote from the major industrial load centers cannot help but have serious consequences to defense production. * * *

If we are to maintain high-level production, whether it be guns or butter or both, materials needed for the production of electric power necessary to such high levels of over-all production cannot be curtailed. For example, it is shortsighted to authorize materials for the building of houses and manufacturing plants unless the needed allocations for the provision of electric power to operate these establishments are made and correlated therewith.

There is need on the part of Federal agencies that control materials and production for a greater awareness and recognition of the time required to construct a power plant. Today it requires from 2 to 3 years to build a power plant. Materials and equipment for use in the construction must be available at definitely scheduled periods in the long-term construction cycle. To meet these dates, allocations of materials to manufacturers and scheduling of their production require many months further lead time. For example, if a generator unit is to be in commercial service by December 1952, most of the structural steel for on-site construction should have been delivered by September 1951—about 15 months ahead of the completion date. The steam boiler should be delivered to the utility 13 months ahead of the completion time of the project, which means that the boiler manufacturer must get the boiler drum steel plate 21 months ahead of completion time, and the steel company needs another 10 months to engineer and fabricate the steel plate itself. Similarly, while the turbine is installed about 6 months before completion of the utility project, the total time required by steel companies, boiler manufacturers, and turbine manufacturers for engineering and fabrication means that the basic materials must be allocated to these manufacturers about 2½ years before the final completion date. These facts must be recognized by the material-allocation authorities if the capacity plans of utilities are to meet the coming defense-load conditions.

State of Oregon Public Utilities Commission

The companies over which we have jurisdiction have expressed their appreciation for the excellent cooperation by the Federal agencies involved in receiving the necessary allocations for material to meet planned increases in productive capacity.

State of Pennsylvania Public Utility Commission

In regard to the best way to insure that the electric-power supply is sufficient to meet the requirements during the defense period, this commission feels that the public utilities should be permitted to secure, without undue restrictions, all of the materials and equipment necessary to enable them to carry out their projected power-expansion programs.

State of South Carolina Public Service Commission

With the present restriction on the use of copper, steel, and aluminum, some of the construction schedules are not being realized and, as a consequence, the margin between available capacity and capacity required for load is being reduced beyond the danger point. * * *

It is our considered belief that presently scheduled generating-plant additions should be carried to completion as scheduled even if it should be necessary to delay start of construction of plants and lines scheduled for 1953, 1954, and 1955. Greater care should be exercised in the allocations of materials so that a large generating-plant or transmission-system addition should not be prevented from being placed in service on account of lack of a very small part of the materials required, especially if sufficient material is probably being used in the provision

of nonessential construction and at times in unnecessary duplication of presently available facilities.

The heavy appliances that require a great deal of construction for the provision of service, such as ranges, water heaters, heat panels, as well as television and radio receivers, are still in abundant demand and are being sold and added to present electrical loads. So long as materials are made available for the manufacture of such appliances, we feel that sufficient aluminum, copper, and steel should be made available for the provision of lines and generating facilities for the provision of electric service to these appliances.

Bennettsville Electric and Water Plant, L. P. Bloxam, superintendent of utilities

It is the personal opinion of the writer, after 20 years of observation of electric utilities, that the Defense Production Board make every effort to help private industries secure equipment needed to complete plants under construction. Remove bottlenecks in proposed projects and there will be plenty of power in the 48 States.

State of South Dakota Public Utilities Commission

The general opinion is: The only action needed by Federal authority is to make available the materials that are under restriction for the carrying out of reasonable construction plans.

State of West Virginia Public Service Commission

In the case of 1952 the situation is going to be again too tight for comfort, but here again it is expected that it will be possible to meet all road requirements provided the capacity now scheduled for completion in 1952 comes through, and comes on the line on dates now projected, and provided further the capacity scheduled for 1953 is also completed on presently projected dates. * * *

Answering, therefore, that part of your question which asks what Federal action, if any, should be taken to prevent or cure power shortages, it seems to me that the most constructive action and one that promises to do the most to assure avoidance of a shortage is to make available to the utilities in our State the necessary materials (particularly the critical materials such as structural steel), and to make sure that they can complete the programs they have now scheduled on the dates set up for bringing the new power into service. In the case of West Virginia, this amounts to close to 1,000,000 kilowatts of new capacity scheduled for completion within the State. * * *

* * * I am somewhat surprised that the press dispatch that I read said nothing about structural steel being made available for the completion of power programs. I don't see how that much new steel can be fabricated or new aluminum produced if the power isn't available.

Making available the required structural materials to complete the projected power programs in our State is, I am informed, equally important to the electric-utility systems in States contiguous to West Virginia, and particularly Pennsylvania, Ohio, and Kentucky. * * * Thus, from that standpoint, I think a great deal can be done to help assure power availability within our own State if the entire area is properly taken care of, and particularly if the utilities of the area can get the necessary materials to complete their construction programs as scheduled.

In the light of the lead time required and changes in the international situation since expansion plans were inaugurated, there is a danger that their plans may not have fully considered the expansion of power requirements due to a step-up in the need for defense items. Be that as it may, these planners have seen their plans decreased in scope and sometimes deferred in the course of the screening process undertaken by the executive department agencies which determine what allocations of materials shall be made to assist in constructing projects. Here we find the first easily identified bottleneck. The planners cannot obtain sufficient allocations to carry out their plans. Your committee has suggested elsewhere in this report that this problem must be met squarely by the Defense Production Administrator and the Director of the Office of Defense Mobilization. Having thoughtfully reached a decision regarding the size of the electric-power-expansion program required, they must take effective steps to

see that adequate allocations are allowed to carry out this program. This does not imply that the expansion program can remain static, for it must increase with increasing needs for electric power. Continuing review of the problem will be required in order that needs for further expansion may be recognized in ample time to allow the necessary lead time for planning and development.

A second easily identified bottleneck which has cropped up in the expansion program is the inability of holders of allocations to obtain the materials to which the allocations in theory entitle them. This difficulty is encountered both in the field of the controlled-materials plan as to steel, copper, and aluminum, and in the realm of related B products required to produce a working electric-power system. Sample comments from industrial and governmental representatives will indicate the scope of this difficulty.

COMMENTS OF INDUSTRIAL AND GOVERNMENTAL REPRESENTATIVES

Edison Electric Institute

Within the past month our representative, Mr. Arthur S. Griswold, member of the Electric Power Survey Committee, has received specific information that use of a new boiler is being held up due to lack of a fan required to operate the boiler.

Central Arizona Light & Power Co.

The Salt River power district has a 30,000-kilowatt steam generating unit under construction to be completed in June 1952. The district is experiencing some difficulty in scheduled equipment delays—tubing and piping supplies—but it is believed that the unit can be completed as scheduled. * * *

While generating equipment may be on order, it is urgent that the various elements of equipment arrive on schedule to coordinate with the completion date. Any one of the principal items undelivered would make it impossible to start the unit.

While it was stated earlier that for the year 1952 the utilities will be able to meet their demand, it is again to be pointed out that a delay in completion date as scheduled for any one of the units expected to be complete and ready for operation during 1952 will reduce the reserve and create a deficit to carry peak load for the year. The reserve will be available with the units in operation as scheduled is counted on to be used by the utilities in California contracting from the Bureau of Reclamation. * * *

Year 1953: All utilities in the State will be able to meet their demands, provided the new steam generating facilities to be installed are completed and ready for operation as indicated below. It is of the utmost importance that there be no delays in this year's scheduled installations because this new installed capacity is counted into the total generating capability to meet the load forecast.

Year 1954: All the utilities in the State will be able to meet their peak demand; but again only if the generating units listed below are installed as per schedule. Their capability is counted into the total capability to meet the peak demand during this year. These units are large-size units, and any delay will reduce the margin of reserve a substantial amount, thus creating a deficit. * * *

The power pool as a whole has a schedule of all the new generating facilities and their completion dates—in effect, it is a timetable. "* * * if the construction timetable is disturbed, the reserve can be very quickly wiped out by the failure of one large generating unit not coming on the line as per schedule, whether it is the Arizona territory or in the California group."

It is our belief that the power pool will continue to meet all situations unless some of the factors as presented above should hinder full use of generating capacity when needed.

California Public Utilities Commission

Failure to provide the means to keep construction schedules abreast of mounting demands inevitably will breed scarcity and curtailment. * * *

The decline for the August 1953 outlook is 236,000 kilowatts. The decline in margins is due to delays to scheduled new capacity completions, caused by deferred equipment-delivery dates, and by added military and defense-load estimates. * * *

In August 1952 the indicated energy margin drops to 2.5 percent and in 1953 returns to only 3.5 percent. These low margins during the critical summer periods indicate urgent need for the completion of the planned new plant program on schedule. * * *

The California Electric Power Co.'s representative stated that power will have to be curtailed each month that the completion of its two new Highgrove steam electric-generating units of 30,000 kilowatts each is delayed beyond the scheduled dates of July and September 1952. The representative of the Southern California Edison Co. testified to delays because of a reduced availability of structural steel and copper. * * *

The deterioration in the outlook for electric-power margins results from impending delays to construction schedules because of difficulties in obtaining steel and copper to complete the new generating plants as well as mounting loads.

Public Service Commission of Indiana

You will notice from the summary sheet, capacity and requirements, by quarters, that the margin in Indiana is rather tight. In fact, in September of 1952 the study indicates a deficiency of 17,500 kilowatts. This study is based on new capacity coming into the system according to commitments made by equipment manufacturers. I should like to point out that we have reports already that the commitments made by manufacturers are slipping and that the above tabulation cannot possibly represent what will actually happen unless this slippage can be arrested and overcome. * * *

Ohio Public Utilities Commission

The reserve margin for December 1951 is deficient even after the installation this year of 427 megawatts of new capacity. The deficiency results from development of defense loads faster than power plant capacity could be provided, and from delays in material and equipment allocations and deliveries for one major unit originally planned for December 1951. However, with the close cooperation and interconnected operation of these several utilities, we are confident that expected loads can be met providing there is no substantial unscheduled outage of major units in the peak period. * * *

The low margins expected for the 1952 peak season are in significant measure due to delays experienced to date in allocations of material and equipment and inability of the manufacturers to hold promised delivery dates. The latter results from similar cuts in allocations and in scheduling problems which the defense program and its handling have created. * * *

A power shortage in 1952 and the forepart of 1953 of serious implications to the defense production program can be averted only if the materials and equipment of the presently planned expansion are delivered to the utilities on time.

Oregon Public Utilities Commission

In a few cases the translation of allocations received in the actual material delivered have been directly the result of manufacturing difficulties.

South Carolina Public Service Commission

A 75,000-kilowatt addition scheduled for July 1952 has already been pushed up until October 1952, on account of delays in receiving materials for this addition. Shipping schedules on such materials as main transformers, low-voltage switch gear, condenser tubes, and small pumps have been delayed 3 months while the main switchboard, heat exchanger, and booster pumps have been delayed 5 months. The evaporator and heaters have been delayed 7 months.

A 100,000-kilowatt addition scheduled for March 1952 has been slipped to May 1952 and a second 100,000-kilowatt addition scheduled for May 1952 has been slipped to July 1952. Later additions have also been slipped some and are expected to slip more under the present material outlook.

With continued slippage of scheduled shipping dates on equipment and materials required, the completion and availability dates of major plant additions will be extended a corresponding length of time.

Utah Department of Business Regulation (public-service commission)

Any delay in dates of operation of scheduled generating plants that may be caused by failure of scheduled equipment deliveries, lack of construction materials, or shortage of trained construction personnel, would result in serious power shortages in the area. * * *

If material and equipment deliveries are received as scheduled, there will be adequate power in this area in the foreseeable future.

West Virginia Public Service Commission

The reason why that is necessary is that with such a small margin between capacity and expected load as now appears to be in prospect for 1952, it is possible to postpone much needed maintenance provided a definite end to the period of postponement is in sight, and this can be done if capacity now projected for completion in 1953 can with certainty be figured on to come in as scheduled. How to assure that is a problem that we have discussed with the two principal utility groups in the State. We have been told by them of delays encountered in scheduling construction and difficulties experienced over the past 4 to 6 months in carrying out planned programs by virtue of the inability to obtain major construction materials and particularly structural steel. A number of large power-plant projects now scheduled for completion in 1952 and some scheduled for completion early in 1953 have been delayed from a month to 3 months by virtue of such delay in obtaining critically needed structural materials.

District of Columbia Public Utilities Commission

It appears important to us that such action as may be possible be taken to assure that scheduled deliveries of materials be maintained in connection with the construction of new generating facilities. The Potomac Electric Power Co., which had the construction of a new 25,000-kilowatt unit under way at the time of the beginning of hostilities in Korea, has already experienced about a 6-month delay in its construction schedule. It was scheduled to be ready for service in March 1952. It now appears that it will not be ready until the fourth quarter of 1952. This delay has been due principally to the inability to obtain the structural steel which had been ordered and scheduled.

Contributing to this problem and pointing up the need for coordination is the fact that different agencies and divisions within the executive department of the Federal Government having jurisdiction over differing phases of allocations for electric-power systems receive different percentages of claimed allocations. For example, these groups fared as follows in the initial allotments of structural steel for the first quarter of 1952:

	Percent
Defense Electric Power Administration	77.1
Electrical Equipment Division, NPA	33.8
Engine and Turbine Division, NPA	96.2

In none of these instances except DEPA does electric power constitute all of the field of operation of the agency or division. Nor is there any assurance how much of allotments granted to these claimant agencies will find their way into the field of electric power. For a well-balanced electric-power-expansion program, it is essential that the required percentages of allotments be obtained from each claimant handling a segment of the electric-power program. Here is where a coordinator is called for to see that this is done. Otherwise, the portion of the 96.2 percent of structural steel granted for engines and turbines in power projects may be sufficient to make equipment which cannot be placed in service because of lack of another vital piece of equipment the allotment for which must be obtained from some other claimant agency. More detailed suggestions to cure this problem will be found in the part of this report headed "Recommendations."

Review of Outlook

Breaking the bottlenecks in this program will do much to give the Nation the electric power it requires, barring any sizable further increase in defense requirements. That the current situation is tight is indicated by DEPA's assertion that even on the basis of its schedules for expansion of electric power capacity, there is no place in the Nation where a 200,000-kilowatt load not already scheduled could be

placed earlier than 1953 without cutting off other industry or diverting equipment from other needed power installations. DEPA adds a caveat that unless materials are available substantially in the amounts requested, the earliest date for this new load would be 1954 instead of 1953. The DEPA expansion schedules would result in a total of 84.5 million kilowatts capacity by 1952, 96.7 million kilowatts by 1953, and 105.1 million kilowatts by 1954.

Against these figures, DEPA calculates total capacity requirements to be 85.8 million kilowatts in 1952, 95 million kilowatts in 1953, and 101.2 million kilowatts in 1954 (not including in the 1953 and 1954 figures certain imminent large industrial and Atomic Energy Commission loads). Statistics presented in the DPA portion of this report dealing with requirements agree with DEPA's estimate. Figures included in the Edison Electric Institute's tenth semiannual power survey are somewhat lower on capability scheduled, i. e., about 84.2 million kilowatts in 1952, 96 million kilowatts in 1953, and 104.1 million kilowatts in 1954, under median hydro conditions. However, its peak load figures are also lower than estimates included in DPA's material.

[In millions of kilowatts]

	1952	1953	1954
EEI	77.3	84.5	90.1
DPA	77.8	85.2	90.8

Using any set of these estimates, it is seen that the gross margins are lower than desirable, especially when it is realized that these gross margins must supply the capacity to cover maintenance, emergency outages, and system operating requirements. Only the remainder out of gross margin is available to carry new power loads.

Yet failure to meet these capabilities on schedule through such reasons as insufficient allocations or inadequate honoring of outstanding allocation or inadequate coordination will serve to decrease the gross margins even lower. Such failure will also compound the maintenance difficulties, because it will require more steady use of older equipment subject to outages which is presently used only intermittently in order to meet peak loads.

Translated into regional statistics, these low gross margins become even more worrisome and actually develop into power deficits in some areas of the country, as indicated in both the DEPA and Edison Electric Institute portions of this report.

These are items which naturally call for the attention of the executive agencies controlling allocations, particularly the Defense Production Administration. It has noted a decrease in expected new power capacity for 1951 and 1952, which it attributes to shortages of material. Its calculations show a slippage of only 200,000 kilowatts capacity in 1951 and 500,000 kilowatts capacity in 1952. Edison Electric Institute estimated losses of 4 million kilowatts capacity in 1952 and 8 million in 1953 as compared to scheduled capacity. The September 10, 1951, issue of Electrical World estimated the 1952 loss in expansion to be from 2 to 3 million kilowatts, and the 1951 loss to be 1 million kilowatts.

DEPA has noted that the Engine and Turbine Division of NPA estimated that reduced allotments for its program have cut back equip-

ment deliveries by 600,000 kilowatts capacity in 1951 and by another 1,400,000 kilowatts in 1952. Although the estimates vary, all agree that slippage is occurring, as noted so frequently in the information submitted by State regulatory commissions. This fact highlights the importance of having the executive department reach a speedy decision on the size of the basic electric power expansion program in order that adequate arrangements may be made in time to permit the expansion program to be carried out. Carrying out its statutory functions, the National Security Resources Board in its Third National Electric Power Survey issued in April 1950 forecast that by 1952 reserves would be inadequate for peacetime loads in the Southeast and the Northwest regions of the country. It reached this conclusion after noting that margins for reserve and additional load were inadequate in many regions during 1947, 1948, and 1949. So this problem of power shortage is not new. But it has been intensified because of increased defense requirements and shortages of materials. A positive approach to remove the shortages is required, not merely an excuse for the existence of the problem. As previously noted, the executive branch, and particularly the Defense Production Administrator, has shown appreciation of the importance of the problem and an inclination to investigate it thoroughly. Urging him to follow through on this matter should be regarded not as criticism, but as a constructive suggestion. History does not record whether Ben Franklin made his famous experiment at the instance of someone who suggested he go fly a kite, but history does record that his experiment resulted in an advance in the harnessing of electricity—the beginning of a great boon to mankind. Let us hope those charged with responsibility meet with similar success in tackling the problems which currently confront the Nation in this same field of electricity.

Hydroelectric power offers a partial solution to the need of the Nation for power, especially from a long-range view. Unfortunately because of the long lead time required, new projects of the hydroelectric type appear to offer little aid in solving the power problem during the next 2 years. According to the Edison Electric Institute, hydro generating units on order and shipped during 1951 will have a total capacity of slightly more than 5.5 million kilowatts as compared with over 27.5 million kilowatts capacity for thermal generating units delivered and on order for a comparable period. Large blocks of hydroelectric power remain available for development in this country—some in areas of the Nation where the power produced could be immediately put to use in the program of defense mobilization. It almost seems at times that we have Aladdin's lamp in our grasp but will not bother to call forth the power of its genie because we can't agree on whether to rub the lamp forward, backward, or from top to bottom. Meanwhile the genie remains imprisoned in the lamp and the benefits of his great powers remain unused. Thinking of potential power, such proposed projects as Passamaquoddy, Niagara power development, and St. Lawrence seaway come to mind along with many proposed river valley developments. In some of these cases, honest differences of opinion exist on where physical structures should be placed to utilize the potential hydro power. In other cases, development lags due to disputes as to the part which shall be played by private, State, or Federal interests. Your committee is in no position to comment on

the merits of the many arguments involved in development of hydroelectric projects. But it does express the hope that, in an area where development of natural resources can contribute so much to the defensive might of the Nation, earnest efforts will be made to compromise the differences which exist. Then and only then can the American public receive the benefit of power which presently goes to waste. Much progress can be made in planning in this field before it is confronted with the difficulties presented by scarcity of materials.

With apologies to John Bunyan of Pilgrim's Progress fame, it may be more than coincidental that the Administrator of DEPA is named Fairman. Without confining its remarks to him alone, however, your committee notes with considerable satisfaction that in this field of industry, divided as it is between the sincere but diametrically opposed views of advocates of private power and public power, from comments made to your committee all segments believe they have received fair treatment from DEPA in carrying out its share of the defense mobilization program. This is true even though some members of the industry believe that their legitimate needs for expansion of electric power production capacity are greater than can be accomplished with the restricted amount of materials available for allocation by DEPA.

Your committee urges continuation of a spirit of cooperation among all segments of the electric power industry in the interest of making most beneficial use of America's resources for defense. It is in the same spirit of cooperation that your committee makes its recommendations in this report, looking toward a concerted effort to make the best use of electric power resources for the good of the Nation.

Conclusions

Three main problems dominate the field in considering the adequacy of the electric-power supply:

1. Widespread difficulties are being encountered in having allocation tickets honored.

2. Because of differences of opinion concerning the size of the expansion program required in this field, doubts are expressed by some as to whether sufficient allocations of materials are being made for increasing electric-power-production capacity.

3. Coupled with the fact that manufacturing capacity for large steam-turbine generators appears to be completely booked through 1953, every day lost in adequate planning now because of lack of appreciation of lead time as a factor means that for a large portion of the electric industry no net gain in productive capacity can be realized until 1954. The lost day cannot be effectively made up until that time. Before then, a new order for such turbines could merely displace another already on the order boards with no net gain in productive capacity. There is no magic wand which can cure this situation. It behooves officials in charge of planning and carrying out the electric-power program to give adequate recognition to lead time and the danger of delay. As shown elsewhere in this report, the usual time required to translate a decision to increase power-production capacity into a physical plant capable of that production varies from 3 to 5 years for a hydroelectric plant. It takes 3 years for a steam plant to be completed.

Have you ever stepped on the starter of an automobile on a cold morning and been unable to start the motor because of battery failure? You have an investment of between $2,000 and $3,000 unable to function because of lack of electric power from a battery representing a cost of about 1 percent of the investment. For your purposes at that moment the automobile is useless and so is the entire investment it represents. The same analogy applies to a defense plant lacking the electric power to make it operate.

Unfortunately, the difficulties of this problem are compounded because, while you can normally replace your automobile battery from any auto-parts supplier's stock, it takes from 3 to 5 years to build electric-power systems for some defense plants, even without considering further delays caused by lack of materials under an allocation economy.

If this study does nothing more than instill in all who control its programing an understanding of the importance of lead time in the electric-power industry, it will have served a useful purpose.

Other problems have also arisen to harass those trying to provide adequate electric power to turn the wheels of America's industries.

An electric-power plant is not like the old automobiles which reputedly would run even without all the component parts with which they were originally equipped. A steam plant needs a boiler and a boiler needs a fan. Yet a fan is a B product in our present system of allocations and may not receive the same preferred treatment as a boiler when it comes to allocations. It is important that in the administration of the allocations system, adequate measures be taken to assure that the fan will be available when needed so that the boiler may be incorporated in the steam plant on schedule and the plant in turn may be ready to supply the energy to produce defense items on time. It is urgent that the "kingdom" not be lost "for want of a horseshoe nail."

Suggestions have also been received from some quarters that action should be taken by the Federal Power Commission, either on its own initiative or as the result of new legislative direction, to recognize the current emergency as one justifying interconnection of electric systems without bringing them under Federal control because of those interconnections.

The Public Utilities Commission of the State of Connecticut advised your committee that it is not clear that the present national emergency constitutes an emergency as designated in section 32.20 of the Rules of Practice and Regulations of the Federal Power Commission and, therefore, it is not clear whether it constitutes an emergency as contemplated by section 202 (d) of the Federal Power Act. The public utilities commission suggests that it would help if the Federal Power Commission recognized the current emergency as such and permitted interconnections without the possible question of jurisdiction over the utility becoming involved.

The Public Service Commission of Indiana stated it had been advised that matters would be expedited greatly if the Federal Power Commission would clarify the interpretation of that section of the Federal Power Act dealing with emergencies. The public service commission stated that there seemed to be a feeling that all States may not have the same definition of an emergency. It suggested that

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your committee could do a very great service by suggesting to the Federal Power Commission that upon its own motion it enter an order under the Federal Power Act declaring an emergency thereby obviating the necessity of any intrastate electric public utility having to determine this matter for itself in considering sections 202 (c) and (d) of the Federal Power Act.

The Public Utilities Commission of Ohio urged your committee to give serious consideration to the provision of more specific legislative exemptions from Federal jurisdiction under the Federal Power Act. It commented that while Ohio utilities are doing much to utilize interconnection facilities, the public utilities commission feels that only by such legislative exemptions can maximum use be made of potential interconnections. More specifically the Public Utilities Commission of Ohio said:

> Optimum utilization of existing interconnections between electric utilities should be fostered. Your letter mentioned reports of reluctance of intrastate utilities to fully utilize interconnection facilities crossing State lines. In this connection we urge your serious consideration of the provision of more specific legislative exemptions to Federal jurisdiction under the Federal Power Act. For all practical purposes there is available under the existing act only temporary administrative exemption. Section 202 (d), to which you referred, provides exemption in case of breakdown but requires the physical removal of the interconnection facilities thereafter. There is also provision for administrative exemption in case of emergencies as determined by the Federal Power Commission.
>
> Section 202 (c) provides no legislative exemption. Broadening of these sections to provide specific legislative exemption would be extremely helpful to the optimum utilization of interconnection facilities in specified types of emergencies and would not creat any hiatus in regulatory control. A review of the cases of assertion of jurisdiction by the Federal Power Commission will reveal the cause of concern on the part of intrastate utilities to which you referred.

The Public Utilities Commission of the State of Colorado stated that it had been advised by Public Service Co. of Colorado that in its opinion a change in the Federal Power Act, or interpretation thereof, is essential to obtain maximum benefits from the integration of a hydroelectric system of the Bureau of Reclamation and the steam power system of the Public Service Co. of Colorado.

The Public Service Commission of Wisconsin informed your committee that while discontinuance of an interconnection made during World War II was probably due to desire to avoid Federal regulation which would have overlapped existing State regulation, on November 7, 1951, the Federal Power Commission authorized the Wisconsin Electric Power Co. and the Public Service Co. of Northern Illinois to reestablish an interconnection which had been in existence during two previous periods.

Of replies received from 36 States the foregoing were the States which suggested consideration of further action by the Federal Power Commission designed to encourage interconnection of electric power systems in order to assure maximum use of existing electric power producing capacity. In general other State commissions indicated that wide use is being made of system interconnections. In its invitations to State commissions to submit comments on the interconnection problem, the staff of the committee noted that it seemed obvious that the more complete our power interconnections are, the more power can be made available where needed without requiring the use of as many scarce materials as would be required to build unconnected systems to a point capable of delivering a like peak power load.

The views of the Federal Power Commission on the problem of interconnections are set forth in a letter dated January 8, 1952, from Commission Chairman Buchanan to the chairman of your committee. This letter is included in subdivision F of part 2 of this report.

A further problem which makes operating difficulties mount in almost geometrical proportions was noted particularly by the Edison Electric Institute. As long as sufficient modern equipment is available to produce normal power needs, older and less efficient equipment can be used for short periods to produce the extra power needed to meet peak power loads. However, if it becomes necessary to operate this older equipment for longer periods of time to help produce the normal power requirements, the number of equipment outages increases substantially, making the problem of producing a firm power supply infinitely more difficult. This fact emphasizes the need for delivering newly scheduled equipment on time.

The task of administering the Defense Production Act of 1950 so that an adequate supply of electric power may be obtained rests wholly on the civilian agencies in the executive department, but is nonetheless essential to the sound defense of this country. The Department of Defense makes no specific recommendations in this field. Rather it relies on other agencies to arrange for adequate electric power to produce the end items required to carry out the strategic plan developed by the National Security Council, the Joint Chiefs of Staff, the Department of Defense, and the Munitions Board. The Munitions Board has advised your committee that it fully appreciates the essentiality of an adequate supply of electric power. Because the military services play no part in providing the necessary power, however, it is doubly essential that the civilian agencies empowered to do so exercise their powers in such a way that no end item required by the Armed Forces is delayed in manufacture or delivery because of a lack of electric energy.

It indeed appears singular that in an industry as large as this, spread over every State of the Union and its Territories, those who were invited to comment on the program with an offer by your committee that confidences would be respected, if requested, made no personal criticism against those administering the program. Such criticism as was offered objectively pointed out the bottlenecks in meeting planned expansion goals. It has heartened your committee that under these circumstances no charge of impropriety or ineptitude was hurled against those in whose hands administration of this program rests. Your committee cannot help but believe that this is a valid indication of a program generally well conducted. All suggestions coming to your committee seem to have been offered in that spirit of constructive criticism which evidences the type of team play required if this Nation is to place itself in a state of readiness to guard its security. It is refreshing to see such a demonstration of cooperation in the national interest among men holding widely diverse views as to the best method for operation of the electric-power industry. It is the hope of your committee that this same spirit of cooperation in the national interest may prevail throughout the current emergency and lead to amicable arrangements among reasonable men so that the natural resources which a benevolent providence has bestowed on this Nation may be harnessed and used for the best interests of all its people.

Recommendations

Office of electric power

1. To gain suitable coordination in this vital program your committee recommends that the Director of the Office of Defense Mobilization give serious consideration to the establishment of an office of electric power with adequate delegated authority to arrange prompt delivery of all components and parts of an electric power plant when, and as needed, once construction of the plant has received approval from the executive agency responsible for providing adequate electric power for defense mobilization needs.

Allocation authority

2. Such an electric power office should be vested with sufficient authority to issue overriding directives or take such less stringent action as may be necessary to see that allocation tickets issued in connection with production of electric power are honored promptly. Your committee notes with approval that the National Production Authority has recently taken some action along this line by designating five officials to act as focal points in providing special assistance to manufacturers who are unable to have their orders filled despite possession of allocation tickets under the controlled-materials plan. This aid from NPA is dependent upon a showing by the manufacturer that he has repeatedly tried to have his allocation tickets honored. More recently the Defense Production Administration has outlined new procedures to deal with shortages of common components such as valves, bolts, nuts, and pumps. It was announced that this program was designed to shunt available supplies into the more essential programs. It is understood that this program will make use of directives to individual manufacturers and suppliers. The actual operation of the program will be conducted by the National Production Authority.

Both of these recent actions by the allocation authorities indicate a realization that general allocation procedures previously in force were not working as well as anticipated. Defense Production Administrator Manly Fleischmann during testimony given to your committee on November 26 acknowledged that the controlled-materials plan was experiencing growing pains and frankly stated that he could not claim to have avoided all the difficulties that arose during World War II in connection with the controlled materials plan. He apparently is approaching solution of these difficulties by the trial-and-error method, making changes in procedure when improvements are called for. In the opinion of your committee, this is a commendable approach to the problem and is a refreshing change from the attitude sometimes encountered in administrative agencies which tend to defend as perfect their existing procedures and excuse the shortcomings of those procedures by attributing them to causes beyond their control. Mr. Fleischmann explained that, because of similar experiences in World War II, DPA was purposely allotting amounts of controlled materials which total 10 percent more than the supply of those materials. He pointed out that after the controlled-materials plan came into full operation during World War II "attrition" developed in honoring those allotments. That is, it was found that the total amount of materials requested from producers was less than

the total amount of allotments to the users of the controlled materials. However, during the current early stages of the present controlled-materials plan, especially in the field of electric power, exactly the opposite difficulty is being encountered, that is, so-called slippage is occurring. In simple terms this means that users of materials are finding it impossible to obtain their allotted amounts from producers. The section of this report headed "Conclusions" has previously noted the drastic adverse effect which slippage causes in the attempt to provide new sources of electric power.

As noted in the portion of this report prepared by the Defense Electric Power Administration on behalf of the executive branch of the Government, DEPA has had a construction expediting branch since shortly after organization of that administration. That trouble-shooting branch has done what it could within its restricted limits to break bottlenecks in the procurement of materials for electric power plants. However, your committee is of the opinion that a more effective job could be done by an electric power office having more authority than that presently possessed by DEPA's construction expediting branch.

Determination of power program

3. Those in charge of allocation policy must give due recognition to the vital need for electric power as an essential ingredient in the formula for successful defense mobilization. The exact amount of power required is a matter subject to honest differences of opinion. The determination of this amount should be recognized as a problem separate from the policy decision regarding what amount of scarce materials should be made available to meet that target. It boils down to the question "How much power do we need?" as distinguished from the question "How much power can we get in an allocated economy?" Your committee appreciates that the latter question is a difficult one to answer, especially when the answer must be obtained by balancing requirements for electric power against requirements for other elements needed in a mobilization economy. Your committee agrees that the needs of the Armed Forces deserve and must get first priority. Administrative officials and policy makers, however, cannot afford to underestimate the need for adequate electric power to produce the items needed by the military services. A Nation twice unprepared for its own defense within the lifetime of those now living should surely recognize the folly of allowing itself to lapse into that situation again. With our understandable pride in the miracles of modern American productive capacity in industry, there is danger that we rely too heavily on the ingenuity of American business to produce vast quantities of defense and civilian materials overnight. It must be realized that production takes time and advance planning. Embarking on a policy of increasing the productive capacity of American industry during the present emergency, care must be taken to see that all necessary elements required for that increase are given due consideration and provided. Obviously one of these elements is electric power. Your committee cannot emphasize too strongly the need for realizing the long lead time required to increase the output of electric power. In the face of past and current predictions by men competent in this field that the Nation faces a power shortage, especially in the Southeast and the Northwest, our policy makers both in Government and in

industry must give full recognition to the lead-time factor. As recently as this month, Administrator Fairman of DEPA forecast that by the end of 1952 total generating capability will be slightly less than total capacity requirements even if the whole 1952 program is achieved. Because electric power, due to physical limitations, cannot be carried effectively to all parts of the country, Mr. Fairman's forecast points up the danger of shortages in specific geographic areas. He believes the prospects are that power will be short in 1952 from the Great Lakes to the Gulf and in the Northwest. His forecast considered the growing aluminum-production program, which consumes vast quantities of electric power. Approximately 10 kilowatt-hours of electricity are required to manufacture a single pound of aluminum.

Already on the controlled materials list, aluminum is held forth as one of the materials which can be used as a substitute in some uses for even scarcer copper. As noted on page 22 of Progress Report No. 11 of your committee, DPA is working on an assumption that the estimated supply of aluminum for the first quarter of 1952 will be 646,000,000 pounds. This translates roughly into a requirement for 6,460,000,000 kilowatt-hours of electricity. Electric output in the week ended December 8 has been estimated at 7,443,964,000 kilowatt-hours, which of itself represents a 7.7-percent increase over estimated output in the comparable 1950 week. Output for the preceding 1951 week ran slightly higher at 7,475,693,000 kilowatt-hours. Projecting this same output into the first quarter of 1952 would give an approximate output of 97 billion kilowatt-hours. While this figure is used for illustrative purposes only and not as an accurate forecast, it is noted that the manufacture of the amount of aluminum contemplated would use about 7 percent of the total available output. With current discussions of an increase in Air Force strength with its accompanying demands for more aluminum, it should be borne in mind that this in turn will greatly increase the demand for electric power.

It must also be remembered that DEPA's estimates for power requirements are based upon present military requirements. Any increase in these requirements—which is entirely possible—will cause an increase in requirements for electric power capacity.

In view of these considerations, there is more danger of underestimating than of overestimating electric power requirements—yet this Nation cannot afford to underestimate those requirements.

The Defense Production Administrator has recognized the importance of the electric power program by appointing a four-man committee from nongovernmental circles who are to advise him on the electric power expansion program. It is composed of Chairman Edward W. Morehouse, vice president of General Public Utilities Corp., New York City; Mr. Ralph Booth of Jackson and Moreland, engineers, of Boston; Mr. Herbert Marks, former counsel to the Office of War Utilities, War Production Board, of Washington, D. C.; and Mr. G. O. Wessenauer, manager of power, Tennessee Valley Authority. The committee is reviewing current expansion plans for electric power and will advise the Defense Production Administrator on a program adequate to meet defense needs. If, after considering the advice of this distinguished committee, the Defense Production Administrator and the Director of Defense Mobilization are convinced of the need for increased expansion of electric power productive capac-

ity, it is imperative that they take the immediate action needed to bring that increased capacity into being on time. It will then be necessary to make increased allocations of raw materials required to effect the increased capacity consistently with other urgent programs, even though this means diverting them from some other program less essential to the national defense. The Defense Production Administrator and the Director of Defense Mobilization must face this unpleasant task unflinchingly in the national interest. For reasons forcibly demonstrated in the DEPA portion of this report, it is not practicable to decrease power loads for residential or other small users in any significant quantity. Nor is the degree of expansion required likely to be attainable by cutting off power to less essential industries. Consequently an increase in required capacity almost necessarily translates into a need for constructing new electric power plants. Because of the lead-time factor, planning and allocation actions must be swift.

Daylight saving time

4. As a measure of aiding existing electric power capacity in meeting peak loads, your committee recommends that the Congress give thorough consideration to the advisability of adopting a national plan of daylight-saving time. Research indicates that invoking such a plan would have the effect of reducing the peak demand for electric power, especially in the Northeast. With a lower peak requirement, fewer additional power plants will be required. Your committee appreciates that this action is normally opposed by the rural population, but points out that farmers too may benefit by having more electricity available to meet the increasing power loads on the Nation's farms. If available capacity is spread more evenly over the day, less conservation will be required from rural and other users at the higher peak period which occurs in the absence of daylight-saving time, should it become necessary to invoke conservation measures.

Atomic energy as source of power

5. Your committee advocates that in the course of studies of nuclear fission, the Atomic Energy Commission give attention to the possibility of adding controlled atomic fission to the sources of energy available for industrial uses. While primary efforts in this field, judging by results publicly known to date, have been devoted to harnessing the forces of fission to direct military uses, potential use of these forces in defense-supporting activities such as electric power production should be carefully explored and fostered. To the primitive man tending the waterwheel using water as a source of power, the flash of lightning in the sky was a phenomenon not recognized as a different source of energy which later generations would tame for the use of man. It is entirely possible we are at a somewhat analogous but more advanced stage of progress now with reference to the explosive reaction of the atom bomb.

Development of hydroelectric power

6. In the field of hydroelectric power production lead time is a factor which must be considered even more than in the construction of thermal electric plants. Hydroelectric power may be said to be one of the few areas of natural resources where we as a Nation can have our cake and eat it too. The water used to develop hydroelectric power

is not used up in the process, but remains available for all the uses which may be made of it even though its potential as a source of power is not used. Under these circumstances and in view of the vast importance of electric power to our modern way of life, development of hydroelectric power deserves the serious attention of the Nation. Another section of this report discusses hydroelectric power more fully. Your committee is not in a position to recommend which specific projects should be undertaken or their relative priority except to note that obviously projects in those areas of the country likely to have a shortage of power required to produce defense items need first attention. It does, however, urge those congressional committees having legislative jurisdiction in this field and those agencies in the executive branch having cognizance of this development to realize fully the need for action long in advance of the date when it is proposed to add power potential to the working capacity of the Nation's electric power production. No new hydroelectric project which has come to your committee's attention could be completed in time sufficient to help meet the power needs of the Nation during 1952 or 1953. This fact again emphasizes the need for allowing a long lead time in planning these projects. It indicates that the present scarcity of materials to construct projects of this nature which prove desirable is no reason why planning in this field should stop. In these projects much work must precede the time when raw materials actually begin to go into construction of the project. As in other types of electric power production, the longer the initial stages of planning hydroelectric power developments are delayed, the longer it will be before the Nation obtains the benefit of their power potential.

Complement hydroelectric plants with thermal plants

7. Because the amount of energy produced by a hydroelectric power plant varies directly with the amount of rainwater which feeds the stream on which it is situated, it is necessary in the interest of a well-rounded adequacy of electric power that due consideration be given by appropriate authorities to complementing hydroelectric plants with thermal plants. If this policy is carried out, the base of firm power available for defense needs can be raised. The more the intriguing science of rainmaking advances, the less necessary this policy may become. However, at the present stage of knowledge in that science, the policy appears to warrant close attention.

Interconnections

8. From the standpoint of making best use of existing facilities, maximum interconnection of power systems is advocated where this will result in a practical medium for making electric power produced by one system available in an area served by another power system. On the whole it seems that most power systems have made fairly extensive use of interconnections. As noted elsewhere in this report, however, a few areas in the country appear to believe better use could be made of existing systems through interconnections if a more favorable Federal legislative or administrative climate prevailed. Your committee recommends that this matter be thoroughly explored by the Federal Power Commission and the appropriate congressional committees having legislative jurisdiction over this problem.

PART 2. REPORTS BY FEDERAL AGENCIES

This part contains reports by the Federal agencies primarily concerned with the electric power program as it relates to defense mobilization. In general these reports set forth the activities and plans of the reporting agencies in this field. They do not necessarily reflect the views of your committee. Its opinions are contained in part 1 of this report. Your committee cannot overlook this opportunity to acknowledge the splendid cooperation it received from all these agencies in connection with this study.

A. Defense Electric Power Administration

This agency was designated as the general coordinator for the executive department in compiling material for the use of your committee. Choice of this agency for this task was logically prompted by the fact that it is the major claimant agency in the Federal Government for the electric power industry. Its report follows.

DEPA REPORT ON ELECTRIC POWER EXPANSION PROGRAM

One of the great phenomena of modern times has been the electrification of virtually all phases of American life. Sixty years ago electricity was used in large metropolitan centers as a substitute for older methods of lighting and for supplying mechanical power. Over the intervening years its applications have grown wider and wider in homes, offices, mills, factories, and farms until today most of the basic processes of living in the United States are completely dependent upon an assured supply of electric power.

The process of electrification has already reached the point where it has become irreversible. Older methods still employed in countries not as completely electrified have been long discarded in the United States.

An indication of the effects which a power failure might have on an American community is shown by the following excerpt from the September 3, 1951, issue of Electrical World Magazine:

"When a Rifle Shot Killed Cape Cod Power

"Last Sunday night at 7 p. m. someone shot the insulators off a 110-kilovolt line in Wareham, Mass., at the armpit of Cape Cod. And * * *

"A half million persons in the cape and Martha's Vineyard vacation areas were without power 1 to 8 hours.

"Theaters, churches, restaurants closed.

"Traffic snarled as street lights and traffic signals went out.

"Electrically operated filling-station pumps were made useless, stranding motorists who were low on gas.

"Mothers who had only electric ranges came to police headquarters to warm their children's bottles.

"Refrigeration failed, and perishable vaccines had to be removed from drug stores to State police barracks, which had emergency power.

"A woman customer called the Hyannis office of Cape & Vineyard Electric Co. and complained, 'I've got 20 cows in my barn and they all have to be milked by mechanical milkers and nobody around here knows how to milk a cow by hand.'

"Power was restored to all areas by 3 a. m. Monday. New Bedford Gas & Edison Light Co. had the line back in operation by 4:15 a. m."

The danger would be considerably greater were a shortage to occur in the winter and in an industrialized area. Industrial production is virtually com-

pletely electrified. Public transit and other public services are similarly dependent upon electric power. In addition, heating of homes, no matter by what fuel, is now generally dependent on electricity.

Power Consumption Outstrips Population and Production Increases

The extent to which the use of electric power has increased in the United States in recent years may be observed by reference to some basic statistics. From 1920 until 1950 the population of the United States increased by slightly more than 40 percent. During roughly the same period (1923–50) production of goods and services expressed in terms of constant dollar gross national product (GNP) increased more than 150 percent. Consumption of electric power rose over 500 percent.

The disparate increases in power consumption and gross national product over the last 30 years are shown in chart A. Both series are based in 1923, a year of relatively full employment. Chart B presents the same data in another way, by showing billions of kilowatt-hours of power consumed per billion dollars of GNP (constant dollars). It will be noted that throughout the period there was tremendous increase in power consumption relative to production and that the most rapid increases occurred in the years 1947 to 1950.

Increase in Power Consumption Since World War II

The rapidity of increases in demand for power since the end of World War II and the shortness of the reconversion period came as a surprise to many experts.

The analysis of the experts was generally correct with respect to total production. Between 1944 and 1950 gross national production dipped sharply and then began to climb so that in 1950 it was about the same as it had been in 1944. Nevertheless, within the total picture, the consumption of electric power between 1944 and 1950 increased 52 percent! The reasons for this sensational postwar increase are found in intensification of the use of electricity. Between 1944 and 1950 use of electricity by the average residential consumer increased almost 60 percent. This was due to the tremendous increase in use of household electric appliances which has occurred in the postwar period.

The increases in industrial use of power have also been significant. This increase is partly due to the introduction of more complex labor-saving machinery. More particularly, it is due to expansion of certain industries which use electricity in enormous quantities. Included among these industries are aluminum, magnesium, ferro-alloys, chemicals, steel production, production of high-octane gasoline, and atomic energy. Moreover, growth in industrial demand has been greatly accelerated by the high-level defense program initiated after the outbreak of the Korean war.

In rural areas where electricity was first used almost exclusively for farmstead lighting, it has in recent years been used more and more to operate agricultural equipment such as poultry brooders, cream separators, water pumps, milking machines, feed mixers, milk coolers, and electric fences. Irrigation also takes large amounts of power. Thus, between 1945 and 1950 the number of rural customers increased 50 percent, with 4.2 million farms electrified through the latter year. Use of electricity on farms increased more than proportionately.

At the present time the demand for electricity, including self-generation, is nearly 60 percent from industry, about 20 percent from residential and rural consumers, and about 20 percent from commercial and miscellaneous uses.

Utility Capacity Increased To Serve Load

To meet the tremendous increases in demand, the electric utility industry has had to expand at comparable rates. During the first 46 years of the industry's existence, from 1880 until 1926, it installed 23,000,000 kilowatts of capacity. In the next 17 years, to 1943, it doubled its capacity, adding another 23,000,000 kilowatts. Still another 23,000,000 kilowatts were added in the 7 years from 1943 through 1950, bringing utility capacity up to 69,000,000 kilowatts. Now, in the 3 years 1951 through 1953 it is necessary to install additional capacity exceeding 23,000,000 kilowatts. Thus, the acceleration in installations of capacity can be seen by the fact that additions of 23,000,000 kilowatts were made first in 46 years, then in 17 years, then in 7 years, and must now be made in 3 years in order to keep pace with the growth in requirements.

During the course of the industry's history, facilities for the transmission and distribution of electric power have been installed as required to keep pace with installation of new generating capacity and demands by new and existing customers. The largest portion of conductor requirements for the industry is used in expanding and reinforcing these transmission and distribution facilities. Therefore, accompanying the increase in generating capacity discussed in a later section are plans for additional facilities for the transmission and distribution of electric power.

Impact of Korean War on Electric Power Program

The outbreak of hostilities in Korea challenged the productive capacity of this country. As was to be expected, the imposition of a military-preparedness program on top of normal civilian activities produced difficulties in the achievement of defense goals.

In the field of electric power, the impact of Korea was especially heavy. Plans for expansion, which in a peacetime economy were sufficient to meet normal demands, suddenly became inadequate in the face of the tremendous growth in demand for power. Whereas the power industry in April 1950 had planned to install an additional 17,000,000 kilowatts of capacity in the 3 years ending in 1953, these plans were revised shortly after the outbreak of hostilities and in April 1951 the estimated 3-year program ending April 1954 called for the installation of 27,000,000 kilowatts.

In addition to producing a pressure for additional electric generating capacity, the attempt to impose industrial expansion on top of the already spiraling civilian program also created other problems. New defense plants were required, and the expansion of basic materials production such as steel, aluminum, and magnesium was undertaken, with a resulting increased demand for basic materials to carry out this construction.

The electric power industry was thus caught between two opposing forces. While materials for expansion of electric power facilities became progressively more difficult to obtain, demand for electric energy increased. The requirement for expanded generating capacity in turn called for larger amounts of steel, copper, and aluminum for the manufacture of heavy power equipment such as generators, boilers, and transformers; for the construction of steam-generating plants and dams for hydroelectric installations; for heavy-voltage transmission lines strung on steel towers; for new distribution connections, and for the reinforcement of overloaded circuits.

Because of the long lead time required to manufacture heavy power equipment and to construct generating plants, demand for electric power can grow much more rapidly than capacity to produce such power can be furnished. The normal time required for new power installations varies from 3 years for steam plants to five or more years for large hydroelectric installations. Industrial plants on the other hand can be constructed in less than 18 months. In addition, the use of electric energy by existing plants can be increased rapidly through the installation of additional machinery and by operating multiple shifts.

The fact that requirements for electric power can increase with far greater rapidity than capacity can be installed is indicated in table I. As that table shows, during the years 1950 and 1951, requirements for electric power increased almost 16,000,000 kilowatts, while despite efforts to speed up construction after the war broke out, only an additional 13,000,000 kilowatts could be added.

Table I.—*Annual increases in generating capacity and December peak requirements*

[In millions of kilowatts]

	Increases in requirements [1]	Increases in capability
1950	8.2	5.8
1951	7.5	6.9
1952	10.6	9.6
1953	[2] 9.2	12.2
1954	[2] 6.2	8.4

[1] See footnote to table II.
[2] See footnote to table II.

This pressure of increased demand against capability, on a Nation-wide scale, has resulted in the wiping out of any positive margin, and in forcing operations with margins less than safe operating practice would require. As the following table shows, there is today no cushion for unforeseen loads and no surplus on which to rely in case of a catastrophe.

TABLE II.—*Total power supply requirements and capacity December peak*

[In millions of kilowatts]

	Total capacity required [1]	Total capacity available
1950	67.5	68.0
1951	75.2	74.9
1952	85.8	84.5
1953	[2] 95.0	96.7
1954	[2] 101.2	105.1

[1] Capacity required includes minimum operating reserve. This reserve does not represent surplus. Minimum operating reserve is capacity that cannot be used for carrying loads because it is needed for equipment outages, for maintenance and repair, and for the regulation of load in transmission systems.
[2] Does not include certain AEC and large industrial loads, which may be in preliminary planning stages.

ESTIMATED FUTURE POWER REQUIREMENTS AND SUPPLY

Estimated total power requirements and capacity for the period January 1952 to December 1954 are contained in table II. These estimates are based upon the most recent figures available from Federal Power Commission, from individual companies, and from regional conferences attended by representatives from utilities in the areas. The figures have been weighed by Defense Electric Power Administration, which is responsible for power supply, and have been checked against independent studies of power demand by classes of consumers. Within the industrial field, an intensive study of power use by types of industries has been conducted. In the opinion of Defense Electric Power Administration, these are minimum figures. On the requirements side, they do not allow for unexpected new demands. In the area of supply, the figures do not represent the capacity which electric power systems might install if materials were plentiful.

In general, even if the installations indicated in table I were made at the dates planned, there is no place in the country where a load of 200,000 kilowatts (such as would be required for a modern four-pot-line aluminum reduction plant) not already scheduled can be placed earlier than 1953 without displacing other industrial loads. Delays in obtaining materials or equipment for power plant expansion will cause the postponement of the installation of additional capacity forecasted in table I and may extend the present critical power supply situation into 1954.

POWER SUPPLY BY REGIONS

For administrative convenience, the United States has been divided into eight geographical power regions. See attached chart. A brief discussion of power supply conditions by regions follows:

Region I

Of all the regions, this has the largest load. Region moderately well integrated by internal connections. External connections to adjacent regions II and III almost nonexistent, but, because of internal integration, not of particular importance or essentiality. Effect of adverse hydro is not serious. Program scheduled by the utilities results in adequate margins in 1953. Generous margins in 1954 suggest the possibility of selected slippage, but local tight spots, particularly in New York State, must be carefully watched.

Region II

Second largest load. Well integrated internally except for possible tie from Michigan group toward Ohio or Indiana, which is under study. Heavy external connections to region III on the south. Fairly substantial connections to region IV on the west. Hydro practically nonexistent. Power situation will be tight until 1953. Slippage not recommended because this region is extremely susceptible to having new large loads imposed on short notice.

Region III

Second largest hydro region. Stringent conditions through 1952, somewhat improved in 1953. Could use some of region II's surplus in 1953 and 1954, especially in the event of adverse hydro. Encroachment on the reserves with possible peak curtailment is indicated in 1952. Region is quite well integrated internally except for Florida. In addition to strong connections to region II, several connections to region V on the west capable of substantial transfer. Fairly strong connections to region IV are under construction.

Region IV

Inadequate reserves during 1952 and tight situation during 1953 and 1954. Hydro is a minor factor. Substantial interregion transfers indicated because some operating pool groups are cut by regional boundaries. Internal integration adequate in industrial eastern part but relatively small in the agricultural western portion. Use of materials for completely effective integration not justified because of long distances and relatively small loads.

Region V

Inadequate reserves at time of August peak loads expected through 1953, intensified by interim requirements of new large loads expected eventually to be self-supplied. Although the region has August summer peak load while regions III and IV as a whole have winter peaks, this diversity can be taken advantage of through regional transfers only partially because of the long transmission distances between the portions of the respective regions where the greatest diversity exists. This region is particularly subject to the sudden imposition of large and important loads. Certain local areas are becoming dangerously short for this reason.

Region VI

Smallest load of all the regions. Few operating pools and scattered nature of load results in higher than usual allowance for operating reserves. Tight power situation in 1952 becomes more comfortable thereafter. Almost totally isolated from the west across the mountains.

Region VII

Hydro is of importance in this region to an extent not found elsewhere in the country. Especially in low-water years energy rather than peak capacity becomes a serious problem. Internal connections are good and being strengthened. There is no effective interconnection to region VIII on the south, though with adequate congressional appropriation such an interconnection could be constructed and in service by 1953. 1951 water considerably above median, which reduces seriousness of prospective load curtailment during the coming winter season. Substantial load curtailment expected during winter 1952–53. Study for this region has been extended through 1956 because of long construction time of hydro projects and shows fairly safe position after 1954, assuming adequate congressional appropriations are made for additional dams now being planned as well as for dams now under way. Cowlitz development for which FPC has recently approved a license for the city of Tacoma, Wash., has been assumed in service initially during 1953. Pelton Dam project, for which a license application is pending before FPC, has not been included in capacity study.

Region VIII

Margin shown by equipment orders placed with manufacturers appears sufficient to permit considerable selected slippage in 1954. Region is well integrated internally. This is one of three regions in which hydro is a major factor in power supply and where the effect of adverse water must be taken into account.

Points To Be Considered in Assessing Required Size of Power Expansion Program

Inherent in the defense program is the goal of expanding productive capacity in amounts sufficient to permit the future military program to be carried on top of essential civilian loads. There is danger that the electric power industry may not achieve this goal.

Two forces combine to make uncertain the future adequacy of power supply: reduction of allocations below amounts needed for a minimum power expansion program, and inability to obtain all the materials allocated. The first point relates to decisions at the policy level. The second involves administrative difficulties at the operating level.

In the area of allocations, it is of course basic to determine what the increased requirements for electric power will be at successive future stages. Expected annual increases in demand and total requirements have been discussed in connection with tables I and II. It must then be determined first how much capacity is needed to carry these loads and second, to what extent the necessary reserve can be obtained by curtailment of nonessential loads rather than by the installation of new capacity.

In determining the required size of the power-expansion program, consideration of the following points, relating to the nature of the electric power industry and the possibilities of curtailment of demand, is important.

1. The production of additional electric power in substantial amounts normally requires 3 years (for a steam plant) to 5 years (for a large hydro plant). This is caused by the long lead time required for producing machinery and completing its installation in complicated generating plants. There is appended a chart which shows a typical steam power plant construction schedule extending over 36 months. On the other hand, large power consuming installations, such as plants for AEC or aluminum reduction, can be constructed in 1 to 2 years.

2. Changing requirements of the defense program have resulted from time to time in unexpected large new demands for electric power. For example, it was thought before November 1, 1951, that the Gulf coast region might enjoy a comfortable margin of capacity over demand during the year 1952. During the month of November, plans were revealed under which that power margin would be totally wiped out. The needs for aluminum production before the in-service date of power facilities engineered for the Alcoa plant at Rockdale, Tex., and for the Kaiser aluminum plant at Chalmette, La., interim power for other critical loads and new, previously unscheduled defense loads were sufficient to use up the expected margin.

3. Manufacturing capacity to produce heavy power equipment, while more than adequate for normal expansion, is nonetheless limited, and for the years 1952 and 1953 is booked to capacity. Furthermore, the production of items such as boilers and turbines takes from 18 to 28 months. These factors combine to limit the time within which additional generating facilities can be installed. In short, while the power program can be slowed down through decreased allocations of materials, it is not capable of rapid expansion in time to catch up with new loads, if unexpected demands are thrust upon it. Adequate planning thus becomes of paramount importance.

4. The electric-power industry is recognized by law as a service industry. To the fullest extent feasible, it is required to meet demands made upon it for power. The industry does not and cannot by law control demand directly. Only indirectly through particular rates, which are themselves subject to regulation by State commissions and the Federal Power Commission, can utilities affect demand.

5. Demand for electric power can most effectively be regulated at the source by limiting expansion of power-consuming industries, such as aluminum, magnesium, ferro-alloys, and chemicals, by eliminating the manufacture of power-driven machine tools, or by curtailing the production of farm and household appliances. Once demand is permitted to grow up, it must be served or controls over the use of power must be imposed by action from outside the utility industry.

6. Use of electricity cannot be curtailed to meet shortages in the same manner as use of tangible commodities like iron and copper. For example, when it was recognized early in 1951 that copper would be in short supply, an order was issued eliminating its use in ash trays, etc., and limiting its use in other production to a percentage of base-period consumption. Despite these limitations, it was still possible for the industries involved to obtain substitutes and continue operation. On the other hand, if the use of electric power by certain plants is eliminated or limited, production in those plants will ordinarily be reduced by a corresponding amount, with comparable loss of jobs to workers.

7. It is more difficult to ration electric energy than it is to ration more tangible commodities. Once a connection is made, control of the quantity and purpose for which electricity is used rests primarily in the hands of the ultimate consumer, who can flick the switch on and off without any outside control.

8. There are more than 40,000,000 power customers in the country, most of whom are domestic consumers and farmers. To apply and enforce a limitation order compelling reduction in the consumption of electric power by all these customers would require an enforcement agency of huge proportions and, unless cooperation were far greater than past history would indicate, would require police-state methods. Of necessity, any enforced curtailment in the consumption of electric energy must be applied principally against the large industrial consumer, who can be policed and controlled with less administrative machinery.

9. Voluntary curtailment of domestic, rural, and commercial use of energy has not in the past created any significant savings. During World War II a voluntary Nation-wide program met with no success. During a temporary shortage in the Southeast, small initial savings were realized, but dropped off after a few weeks. Even where an enforced reduction in consumption has been attempted, results have been discouraging. In California during 1948, after the public-utility commission ordered a 20-percent reduction in consumption, use of power by residential consumers actually increased.

Significant local cooperation has been obtained only where peak shortages have existed. Considerable relief has been obtained through voluntary staggering of shifts, and through the postponement of the use of power to a later time.

10. Only minor savings in electric energy can be produced through the imposition of a brown-out. Results from the Nation-wide brown-out imposed in the early part of 1945 indicates that not more than a 1-percent reduction in energy sales (kilowatt-hours) and not more than a 2-percent reduction in peak load could be obtained. The imposition of such a brown-out as an alternative to adequately increasing power supply has serious implications. If the size of the power program were reduced by the equivalent of estimated amounts saved by a brown-out, the industrial stability of this country would be dependent upon the continuation of the brown-out.

11. Curtailment of industrial use of power through the imposition of a limitation order in general necessitates a difficult choice between continued operation of defense-required plants, such as aluminum, chemicals, and ferro-alloys, which employ comparatively small numbers of workers, on the one hand, and unemployment in other industries where manpower employed per unit of power consumption is relatively high. In the Pacific Northwest, for example, it is estimated that a saving in electric energy sufficient to run two aluminum potlines would cause unemployment in the remaining industries roughly equivalent to 25,000 workers. Similar problems would be presented elsewhere. In the Southeast, among industries employing relatively large numbers of workers compared to power consumption, is textile manufacturing. Employment in this industry would be seriously affected if it were necessary to obtain substantial savings in power in order to maintain aluminum production in that area.

Specific Proposals To Ease Power Shortage Problems

Three steps have been suggested to aid in solving power shortage problems without installing additional capacity. These proposals involve: use of interconnections, work rescheduling, and imposition of national daylight-saving time.

1. Wide use has been made of interconnections for transferring power upon an emergency basis, and where operating conditions and other factors permit, on a day-to-day basis. Whether such interconnections are practicable depends on such factors as the load centers of utilities involved, the periods of their power demands, and distances between generating stations.

Since Korea a number of additional interconnections have been made and others are being studied. For example, to meet interim Atomic Energy Commission loads at Paducah and Oak Ridge interties and reinforcements of systems covering one-fourth of the Nation have been made. To a smaller degree similar operations have taken place or are being planned in other areas. An important interconnection still in the planning stage because congressional appropriations are required, is the connection between Oregon and California. This tie would permit the sale during summer months of hydrogenerated power from Oregon into California, and during winter months when water conditions limit the capacity of Northwest hydrogenerators, the transfer of surplus steam-generated power from California.

There is a technical limit to the assistance which can be obtained from transferring power over interconnections. Large distances and transmission losses can make the costs of interconnections prohibitive both economically and from the materials standpoint. Furthermore, transmission can only move, it cannot create kilowatts. In planning a power program, a balance must be maintained between the use of critical materials for interconnections and their use in supplying generating facilities close to the load centers.

The use of interconnections cannot be thought of as a substitute for adequate operating reserves within each region. If too great dependence is placed upon operating reserves of other systems, effects of equipment breakdowns, instead of being confined to a single region, may extend over large areas of the country.

2. Results from rescheduling the hours of operation of some large power loads to take them off of a peak and put them in hours of the day when capacity is available for them, offers less encouragement today than during World War II. Such a step obviously involves nighttime operations. It may be difficult to accomplish as much along these lines as formerly, because of difficulties in obtaining or retaining the services of labor beyond normal industry working hours. Unless large wage premiums could be given, industries attempting such a load shift might very well lose their labor force.

3. Daylight saving on a year-round schedule offers some attraction but only in certain regions. In the South (regions III and V) where power supply is tight, its effect is negligible. In the Northwest (region VII) over a whole winter season it produces very little assistance. Greatest assistance comes in the North Atlantic (region I) where daylight savings might provide a half million kilowatts, and in the Southwest Pacific (region VIII) where about half that much appears realizable, two areas in which power conditions are more favorable than in many others.

Achievement of the Power Program

Achievement of the electric power expansion program must be accomplished within the framework of the controlled materials plan which was placed in operation under the provisions of the Defense Production Act of 1950. Under this plan, the needs of the electric power industry, both for its construction program and for maintenance and repair, are handled through the combined and coordinated efforts of DEPA, which is responsible for the generation, transmission, and distribution of electric energy; and of four NPA industry divisions which act as claimants for materials needed by manufacturers of machinery and equipment used by electric utilities. These divisions are: Engine and Turbine Division (turbo-generators, both steam and hydro, boilers, etc.); Electrical Equipment Division (transformers switchgear, etc.); General Industrial Equipment Division (cranes, fans, blowers, pumps, etc.); and General Components Division (valves, etc.).

Defense Electric Power Administration, as claimant for all electric power systems, private, Federal, municipal, and cooperative, files a request each quarter with Defense Production Administration for the steel, copper, and aluminum needed by electric utilities as construction materials and for maintenance and repair work. These materials include structural steel for steam plant and powerhouse construction and for the support of heavy equipment placed in those structures; tubing and pipe to connect equipment, structural steel to make up high tension line towers; copper and aluminum conductor needed for construction of transmission and distribution lines.

Materials which are allotted to DEPA for the power program are then reallotted to individual electric utilities under the provisions of the electric utility order, NPA Order M–50, in two ways: (1) By specific allotments for large construction jobs, including virtually all additions to generating plants; (2) by lump-sum allotments, based on variable percentages of 1950 use, for minor construction, maintenance and repair.

By agreement between the Secretaries of Interior and Agriculture, the Rural Electrification Administration receives a suballotment from DEPA of a proportionate share of materials allocated for the electric power program. REA then administers the distribution of these materials to rural electric cooperatives within the framework of NPA Order M–50, although DEPA retains the right to select projects of special importance which are to be preferred.

Coordination of the Power Program and Conservation of Materials

Construction plans of electric utilities and requirements for materials to carry out these projects are carefully geared to the power expansion program which has been discussed above. This program contemplates the installation of new generating capacity and major transmission lines during the next few years in sufficient quantity and at such times and places as to avert, so far as possible, threatened power shortages.

In addition, there is a close working relationship between DEPA and the Engine and Turbine Division of NPA. Plans for new generating plants are checked against the manufacturers' order boards to make sure that projects of first importance receive equipment when needed and that only such other projects will be approved as can obtain heavy power generating equipment from the manufacturers. Steps have also been taken to extend this coordination to

the other three industry divisions concerned with the manufacture of electrical equipment needed by utilities, to make sure that these divisions in turn are allotted sufficient materials for the manufacture of the other vital pieces of equipment necessary to keep the entire power program in phase.

Material requirements submitted by DEPA for the above-mentioned construction and maintenance work are developed from carefully considered and screened industry requests. Total requirements are first judged from quarterly industry reports which are required from all class I electric utilities (numbering about 280 companies) which account for over 90 percent of total needs.

These requests are then adjusted according to the latest available information concerning delivery disappointments and other factors including projects postponed because of material shortages in previous quarters.

In the area of major electric power construction, further screening of materials needs are made on a project basis, so that material requirements of this portion of the program exactly reflect the expansion approved by DEPA. This is assured by the following steps:

1. For each proposed generating plant addition, the utility files a Form DEPA–9, justifying the installation and its requested timing, and setting forth its controlled materials requirements.

2. The proposed installation is reviewed by DEPA's engineering staff and, if approved, a critical operating date is established. This is the date after which critical power supply conditions would exist in the area if the proposed new capacity were not in service.

3. DEPA informs the NPA Engine and Turbine and Electrical Equipment Divisions of any changes in schedules for production or shipment of major power equipment which can or should be made to accord with the critical operating date.

4. If the utility's request for controlled materials on Form DEPA–9 envision an earlier operating date than has been established by DEPA, controlled materials allotments are denied or reduced accordingly and the utility is sent a letter requesting a rescheduling of quarterly requirements.

5. In reviewing Forms DEPA–9, DEPA's engineers check controlled materials totals requested in item 9 of the form against detail provided in item 12 of the form, screening out B products and nonessential uses of materials. For example, particular scrutiny is given to structural steel requirements for boiler installations to make certain that no duplication exists between the utility's requirements and those of the boiler manufacturer.

6. The DEPA–9 project applications, thus adjusted, amended, and screened, provide the basis for DEPA's controlled materials requirements for power plant construction.

7. Similar engineering review is applied to the major transmission and distribution projects.

If DEPA approves a construction project, it issues quarterly allotments, but only after careful screening of the request for materials made by the utility. As indicated above, DEPA makes certain that the requested delivery of materials is no earlier than required to meet the scheduled in-service date. It further assures that the proposed uses of materials are the minimum necessary for effective operation of the completed project, i. e., that quantities required are minimum quantities, and that no use of scarce materials is proposed where less scarce materials would suffice.

Transmission and Distribution Facilities

The pressure of demand on the generating capacity of electric utilities has been discussed previously. Similar pressure exists on the capacity of transmission and distribution systems of electric utilities.

Electric utilities must build transmission lines at this time for the following reasons:

1. *To connect new generating capacity.*—New power sources are placed as near the loads as possible, but hydro plants have to be built where the water falls, and steam plants must be built where adequate cooling water is available. The new capacity obviously cannot be brought into service without transmission connections from these sites to the power systems.

2. *To serve new defense loads.*—Direct connections at transmission voltages are required to the premises of new defense plants or to older facilities in cases

where loads have increased beyond the carrying capacity of existing lines. In addition, the development of certain large new industrial loads has necessitated system interconnections and reinforcements in order to mobilize and assure the needed power supply. For example, in order to provide interim power supply to AEC facilities at Oak Ridge and Paducah, power has been mobilized from utilities in the Midwest, Southwest, and Southeast, requiring a series of transmission lines which alone will require an estimated 12,000,000 pounds of aluminum.

3. *Interconnections between power systems.*—Interconnections have become necessary for a variety of reasons, such as to reinforce power systems on which unusually rapid growth of power requirements has occurred or is expected and to reduce the amount of new generating capacity which would otherwise be required to provide adequate operating reserves. These new tie lines, thanks to a generally sound basic network, are relatively few in number.

4. *General reinforcement.*—It is characteristic of electric power systems that transmission networks require reinforcement and extensions within systems as generating capacity and power loads increase. Such reinforcement and extension is required to a considerable extent at this time for supply of power to defense industries.

Because of the rapid increases in defense loads and in installations of new generating capacity, electric utilities at the beginning of 1951 had projected a transmission program for 1951 which exceeded miles of line built in 1950 by about 40 percent. The comparison is as follows:

Construction of transmission

[In miles]

Voltage	1950 (actual)	1951 (planned)	Percent increase
11-65 kilovolts	9,615	11,175	16
66 kilovolts and up	6,806	11,560	70
Total	16,421	22,735	38

Notwithstanding this need for a sharply increased transmission program, amounts of aluminum conductor (the material used for the bulk of transmission lines) made available to utilities during 1951 were only slightly greater than amounts actually used in 1950. This comparison follows:

Aluminum conductor used and allotted

[In millions of pounds]

	1950 use	1951
First quarter	30.9	[1] 38.9
Second quarter	37.8	[1] 41.6
Third quarter	39.9	[2] 38.0
Fourth quarter	41.4	[2] 35.5
Total	150.0	154.0

[1] Receipts reported by utilities.
[2] Amounts allotted to industry.

Source: Electrical World, Jan. 29, 1951.

As a consequence, existing transmission systems are overloaded. Increased amounts of conductor and other materials for transmission construction are required to make up for this lost ground.

The situation with respect to utility distribution systems is, if anything, even more serious.

Under normal circumstances, as the load to be carried increases, distribution systems are extended and reinforced, either by the construction of additional

lines or by the replacement of old lines with new ones of heavier capacity. The large increases in loads which have occurred since the beginning of the Korean war have made such extension and reinforcement an urgent necessity for many utility systems during 1951.

At the same time new customers, which utilities are legally required to serve, have been added in 1951 at approximately the same rate as in 1950, the comparison being 2.1 million customers added in 1950 and 1.9 million new customers estimated for 1951, of which over 90 percent have been new residential and rural customers.

In spite of the fact that new customer connections in 1951 have been at the 1950 level and that need for reinforcement of distribution systems has greatly increased, amounts of copper conductor (the material generally used for distribution work) made available to utilities during 1951 was considerably less than the amounts used in 1950. The comparison follows:

Copper conductor used and received

[In millions of pounds]

	1950 use (actual)	1951
First quarter	81.8	[1] 69.3
Second quarter	98.7	[1] 63.2
Third quarter	97.4	[2] 54.0
Fourth quarter	96.4	[2] 74.0
Total	374.3	260.5

[1] Actual receipts reported by utilities.
[2] Amount allotted to utility industry. It is doubted that more than 61 million of this amount will actually be received by utilities due to turn-downs of orders by mills and suppliers.

As a result of short material supplies experienced during 1951, the stability of the distribution system of almost every major utility is threatened. Overloads on system circuits have now reached excessive limits and utilities must carry on an organized program of relieving these overloaded conditions or be faced with burn-outs of customers' utilization devices, circuit failures, interruption to electric service and damage to utility equipment. Such mishaps are now occurring throughout the country at a rate far in excess of normal. They are extremely costly both in financial and economic terms.

As a step toward solution of the critical situation of utility distribution systems, the Defense Electric Power Administration has under way a program to bring about a switch from use of copper to use of aluminum for distribution work. This program can make little progress, however, until increased allotments of aluminum are available. It is estimated this will not occur until the third quarter 1952 at the earliest. Even at that time, allowance must be made for the length of time necessary to teach new techniques to crews and to furnish pole line hardware and tools for the new material.

Materials Obstacles and Bottlenecks Encountered

In carrying through the power program under the controlled materials plan, certain obstacles and bottlenecks have been encountered from time to time and have jeopardized the achievement of the expansion program. Most of these obstacles have been overcome, although lesser difficulties are still being experienced.

The power program, along with other defense-supporting programs, has been caught in a squeeze between the expanding requirements of the military program on the one hand, and the needs of the civilian economy on the other. After allotments have been made in quantities necessary to keep the military and AEC programs on schedule and to maintain the civilian economy at the minimum levels considered necessary, amounts left for allocation for maintenance and expansion of the power program and other defense-supporting programs have been considerably less than the stated requirements for these programs. There follows a summary of CMP allotments asked and granted by Defense Electric Power Administration for the electric power program:

	Steel	Copper	Aluminum
	Tons	*Thousands of pounds*	*Thousands of pounds*
Second quarter 1951:			
Asked	[1] 213,158	111,209	54,600
Granted	[1] 180,000	92,700	49,000
Percent granted	84.4	83.4	89.7
Third quarter 1951:			
Asked	345,289	118,480	47,500
Granted	300,000	77,000	[2] 38,000
Percent granted	86.9	65.0	80.0
Fourth quarter 1951:			
Asked	338,578	95,801	53,226
Granted	304,176	80,852	[2] 35,500
Percent granted	89.8	84.4	66.7
First quarter 1952:			
Asked	398,765	94,894	[3] 55,452
Granted	309,550	79,050	[3] 45,000
Percent granted	77.6	83.3	81.2

[1] May and June only.
[2] In addition, amounts of covered aluminum were made available to electric utilities through the Copper Division, as follows: Third quarter 1951, 3,200,000 pounds; fourth quarter 1951, 4,050,000 pounds.
[3] Includes 6,000,000 pounds of covered aluminum.

Although the electric power program received favorable treatment compared to most other nonmilitary programs, the effect of reduced allocations has been reflected in the postponement of construction to the latest possible date to meet critical loads, in reduced operating reserve, in postponement of system reinforcement and other maintenance work, and in delays to new service connections.

In the area of important heavy power equipment and components needed for the operation of generating plants, similarly reduced allocations of materials have been reflected in decreased production. Engine and Turbine Division has estimated that reduced allotments for its program have resulted in a cut-back of deliveries of equipment representing 600,000 kilowatts capacity in 1951 and an aggregate of 2,000,000 kilowatts through 1952. Allocations of other items of electrical equipment have in some cases been more severely reduced. Steps are being taken by DPA, DEPA, and the industry divisions of NPA to coordinate the allocations of materials and the manufacture of equipment to meet the requirements of the power program.

Only if materials can be allocated for the power construction program and for the manufacture of power equipment in quantities sufficient to meet the demands of the over-all power program can an adequate supply of electric energy be assured for the future.

Steel is particularly important in carrying out the power-generation program. This material is needed chiefly for construction of generating plants and for high-voltage transmission towers, also for substations needed to deliver power. Structural and plate steel, which are the critical items today, are required in the following proportions for various types of installations in the second quarter 1952:

[Percent]

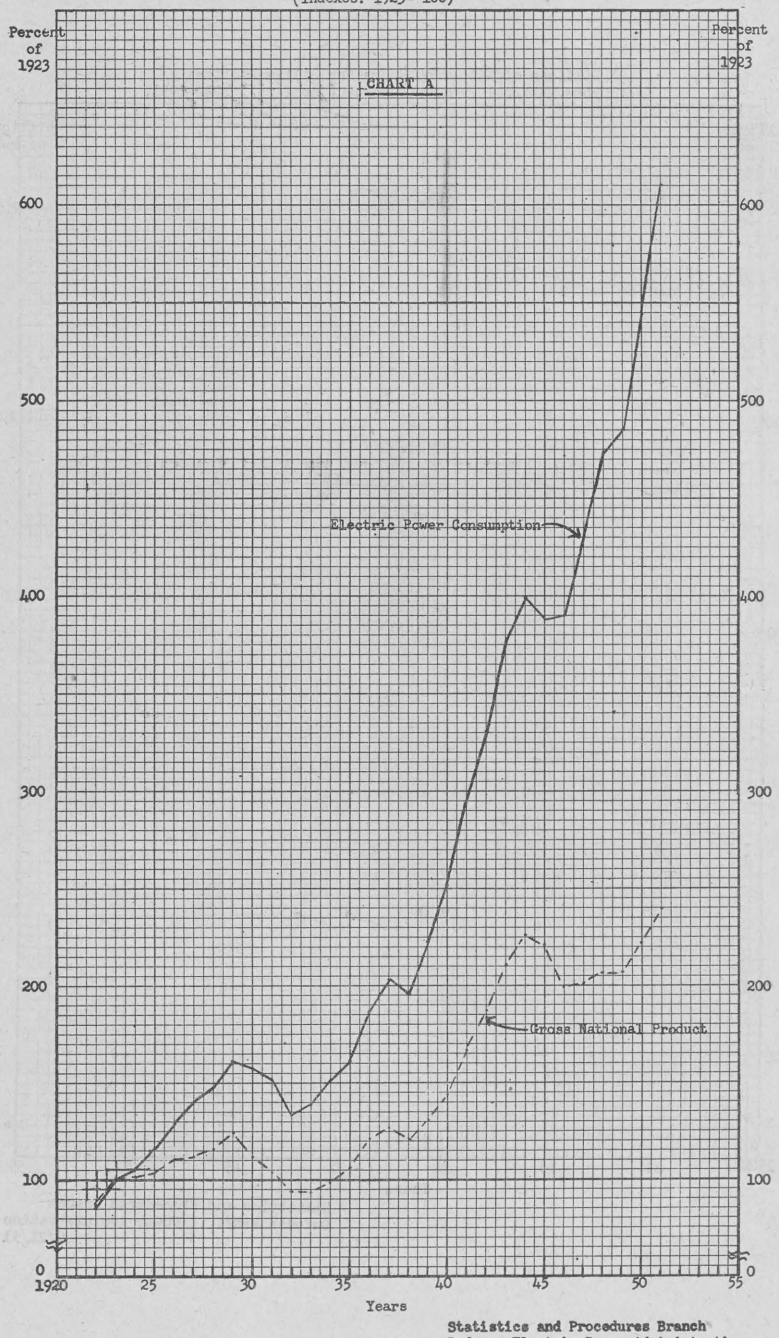
	Structural	Plate
Generating plants	75	93
Transmission and substations	23	7
Other	2	0
Total requested by DEPA	100	100

The situation produced by the reduced allotments of materials has been aggravated by the inability to place orders representing a substantial proportion of allocations issued to electric utilities. This difficulty, which is common to other defense-supporting programs, has imposed a considerable operating and financial burden on utilities.

The inability to place orders to the full amount of allocations has been caused in great measure by the following features:

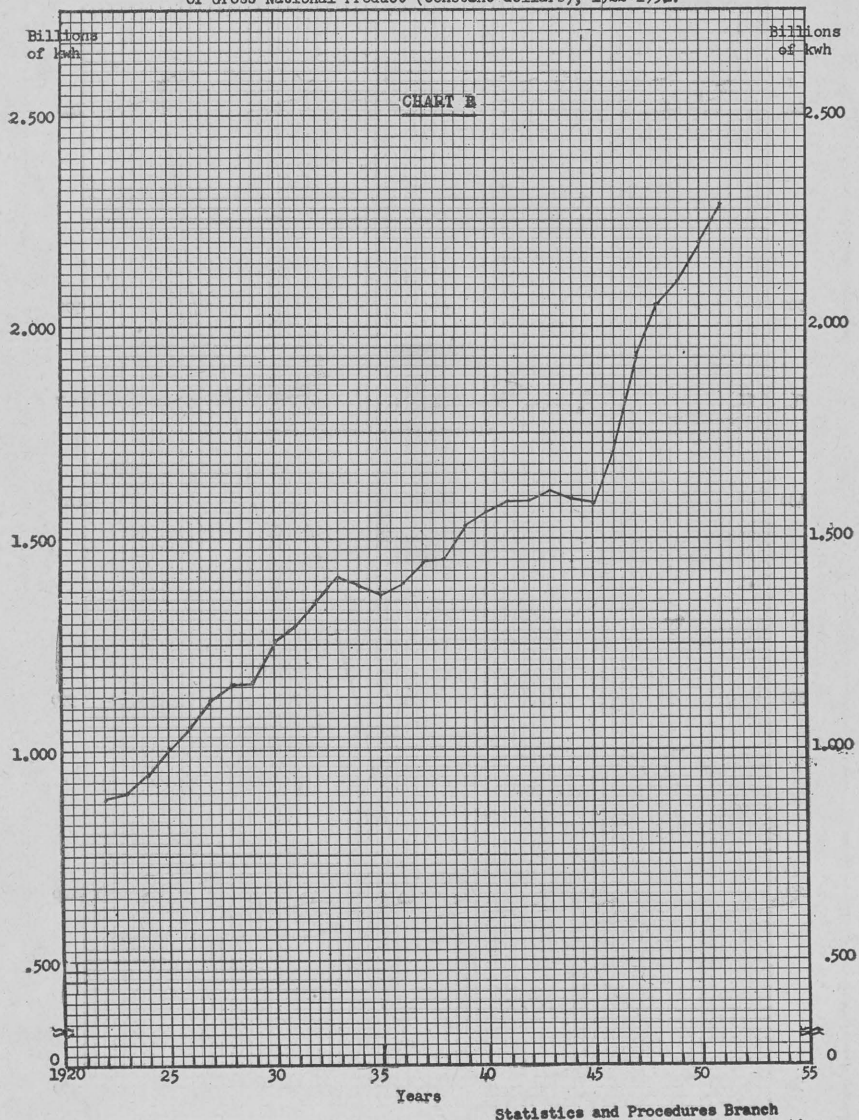
1. Defense Production Administration has issued allotments in amounts which exceed the estimated supply of metals. This action was taken advisedly, and was based on experience during the last war. It was expected that a certain amount of attrition would result, that is to say, that some allotments issued to consumers would not be passed along because of changes in plans, overestimates of need, and other factors. Because conditions have changed since World War

Total Electric Power Consumption Compared With Gross National Product (constant dollars)
(Indexes: 1923= 100)

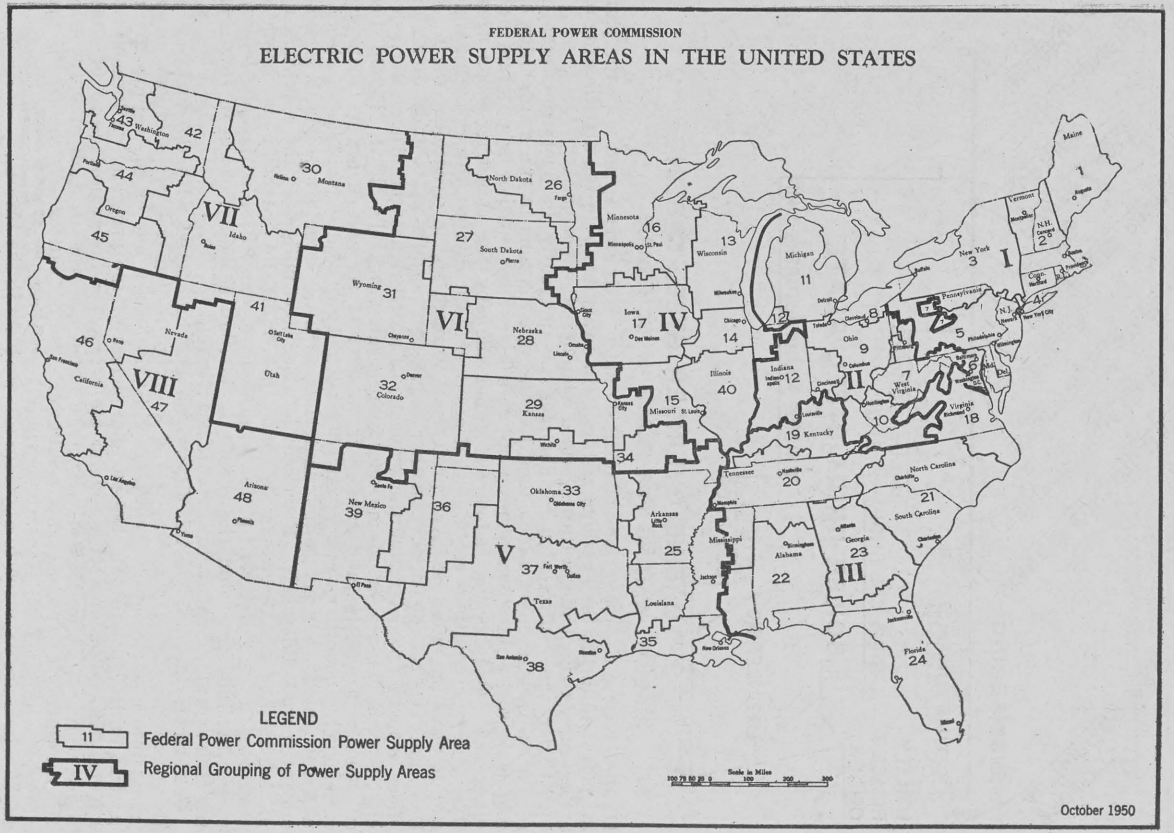


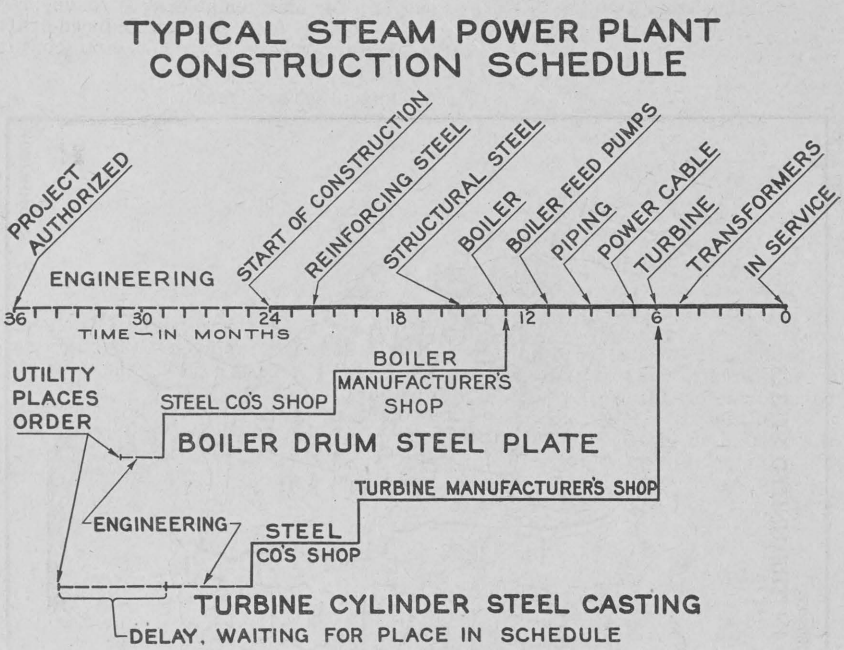
Statistics and Procedures Branch
Defense Electric Power Administration
9/21/51

Billions of Kilo-watt Hours Per Billion Dollars
of Gross National Product (constant dollars), 1922-1951.



Statistics and Procedures Branch
Defense Electric Power Administration
9/21/51


FEDERAL POWER COMMISSION
ELECTRIC POWER SUPPLY AREAS IN THE UNITED STATES
LEGEND
11 Federal Power Commission Power Supply Area
IV Regional Grouping of Power Supply Areas
Scale in Miles
October 1950



II, and because the operations of CMP do not exactly correspond with the plan in operation during the previous war, certain adjustments in the attrition factor are expected to be made in future, based upon actual experience.

2. Under the controlled-materials plan, as presently in operation, certain regulations are in effect which tend to cause fluctuations in the availability of materials to be felt to a disproportionate extent by the power program and other defense-supporting industries rather than by the consumer-goods area. One of these regulations requires that allotments for direct military and atomic energy programs must be given preference through special treatment for A, B, C, E, and DX rated orders. Another regulation permits mills and other suppliers of metals to determine the sequence in which remaining orders, not associated with defense or atomic-energy programs, will be filled. Established customer relationships and greater familiarity of regular customers with procurement methods have understandably worked to the disadvantage of electric utilities which use construction materials such as structural and plate steel only at sporadic intervals. For example, after steel mills meet the requirements of defense and atomic-energy programs and fulfill the orders of customers of their own choice, the electric-power program is in competition with other defense-supporting industries and the remaining civilian economy. It is in this area that the overallotment factor is most heavily felt.

A further considerable difficulty which has interfered with the progress of the power-expansion program is the shortage of various items of equipment going into electric-power facilities. This has arisen out of the failure in the past to entirely coordinate the various phases of the program. Allotments to various NPA divisions which claim materials for the manufacture of these items were not at first effectively coordinated either with each other or with the allotments to Defense Electric Power Administration. As mentioned previously in this report, this problem has been recognized, and steps are being taken which are expected to alleviate this problem in the future.

In addition to the long-range coordination of the power program, immediate problems are being faced and largely overcome by short-term action. Defense Electric Power Administration has established a Construction Expediting Branch whose job it is to attempt to assure delivery of materials and equipment for the most urgent utility construction projects. A staff of nine engineers, plus clerical help, is presently required to handle requests for special assistance, which are coming in at the rate of more than 400 a month. Among the principal items for which special assistance is being requested from DEPA and is being granted through directives and spot assistance help given by NPA are: steel, plate and structural; steel transmission towers; copper conductor; heat exchangers; pre-

cipitators; cranes for installing equipment and for maintenance; coal conveyors; high-pressure valves; pipes; transformers; boiler feed pumps; induced-draft fans; and electrical equipment such as meters, relays, switches, and circuit breakers.

UNITED STATES DEPARTMENT OF THE INTERIOR

DEFENSE ELECTRIC POWER ADMINISTRATION

INSTRUCTIONS FOR FORM DEPA–1 (REVISION 2)

"CLASS I ELECTRIC UTILITY QUARTERLY CONTROLLED MATERIALS REPORT"

GENERAL

1. Purpose of report: To review controlled materials requirements for the second quarter 1952 and to furnish information on controlled materials receipts for the third quarter 1951 for the electric power industry as a whole. The report is being sent to class I systems only but DEPA will apply expansion factors to account for the remainder of the industry. The form will not be used as a basis for determining allotments to individual utilities.

2. All class I electric utility systems, defined as those whose net energy for the system is more than 50 million kilowatt-hours per year, are required to file a single copy of Form DEPA–1 (Revision 2) before October 29, 1951, with the Defense Electric Power Administration, Department of the Interior, Washington 25, D. C.

3. Materials to be reported refer only to the construction and maintenance of electric utility facilities. Do not include materials required for gas, water, transit, appliance repair, or other activities not involved in electric utility operations. Also, do not report materials required for construction of office buildings, garages, warehouses, retail showrooms, and other facilities not integrally connected with facilities for the generation, transmission, and distribution of electric power.

4. For distinction between major plant additions, columns (c) and (d), and minor requirements, columns (e) and (f), see the definitions in NPA Order M–50 dated August 21, 1951.

5. Do not include the controlled materials content of class B products. For definition of controlled materials and aid in classifying certain items, see Schedule I of CMP Regulation 1, DEPA Industry Letter No. 7 and amendments thereto. For a list of class B products, see the "Official CMP class B products list" issued September 1, 1951, by the National Production Authority.

6. Do not show requirements for uses of materials which are prohibited by NPA regulations.

7. It is contemplated that a form similar to this one will henceforth be a regular quarterly reporting form for all class I electric utilities.

SPECIFIC INSTRUCTIONS

Section III. Controlled materials received third quarter 1951 and required second quarter 1952

Receipts third quarter 1951, columns (c) and (e).—Include all controlled materials which were received by the electric utility, its construction contractors, fabricators of class A products for the utility, and, with respect to minor requirements, repairmen doing work for the utility in the third quarter 1951, regardless of when the controlled materials were or will be used. In calculating 3Q51 receipts use product classifications in effect at that time—for example, none of the changes in amendment 2 to Industry Letter No. 7 were effective during the third quarter 1951. Therefore disregard these changes in calculating 3Q51 receipts.

The receipts data for minor requirements will duplicate receipts data on Form DEPA–8 (Revision 1) with the exception that on Form DEPA–8 all data are in pounds whereas on Form DEPA–1 carbon and alloy steel data are in tons.

Requirements second quarter 1952, columns (d) and (f).—State your best estimate of amounts of controlled materials which must be shipped during the second quarter 1952 to the electric utility, its construction contractors, fabricators of class A products for the utility and, with respect to minor requirements, repairmen doing work for the utility, regardless of when the materials will be used. The estimates for carbon steel, copper wire mill products, and aluminum in column (d) should be the same as the totals for individual major plant additions listed in section V. Use the latest revisions in CMP classifications, as indicated in the September 1, 1951, revision of NPA's "Official class B product list," DEPA Industry Letter No. 7 and amendments thereto. *Please do*

not overstate requirements. Overstatements can produce no benefit for you and work ultimately to the detriment of the power program.

Exclude from estimated requirements for the second quarter 1952 the following:

(*a*) Amounts requested by you for the fourth quarter 1951 and first quarter 1952 for which you have received neither an allotment nor a denial letter prior to filing this form; DEPA will estimate these amounts.

(*b*) Amounts allotted to you for the fourth quarter 1951 and first quarter 1952 which have not been definitely rejected by mills prior to your filing of this form; DEPA will estimate these amounts.

On the other hand, you should include as second quarter 1952 requirements in sections III and V any amounts requested by you or allotted to you for earlier quarters than second quarter 1952 *if you have received definite denials from either DEPA or mills prior to filing of this form,* and if you have filed or intend to file amendments adjusting your second quarter 1952 requirements because of such denials.

Section IV. Controlled materials used—third quarter 1951

Include amounts of aluminum and copper wire mill products which were incorporated into electric utility plant, fabricated into class A products for the electric utility or, with respect to minor requirements, used by repairmen in work for the electric utility during the third quarter 1951, regardless of when such materials were received by the utility, its construction contractors, fabricators, or repairmen.

Section V. Requirements for individual major plant additions (p. 2, reverse side of form)

This section should provide a complete project-by-project itemization of the second quarter 1952 requirements shown in section III, column (d), for carbon steel (plate, structural, and other), copper wire mill products, and aluminum. Your best estimates of materials requirements are sufficient if engineering plans are not yet final. Be sure to include controlled materials requirements for the second quarter 1952 only, not for the entire project if it extends over other quarters as well. List all generation major plant additions first. Then list transmission and distribution major plant additions.

Column (i). DEPA serial number—If project filing has not yet been made, or if made so recently that DEPA serial number has not yet been received, state "unknown" in this column.

Column (j). Brief description and location.—For generation major plant additions, state name of station and number and size of units. For line construction give kilovolt, terminal points, length of line, and type of supports. For substation construction give name, location, and voltages. See sample listings below.

Columns (k) through (p). Self-explanatory.—For your guidance in filling out section V, the following sample listings are provided:

Major plant addition project listings

DEPA Serial No.	Brief description and location	In service date	Second quarter 1951 controlled materials requirements				
			Carbon steel			Copper wire mill products	Aluminum
			Plate	Structural	Other carbon		
(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
			Tons	*Tons*	*Tons*	*Lbs.*	*Lbs.*
0000 A	Gerard plant No. 3, 180,000 kilowatts.	June 1953	375	305	500	15,000	
9999 A	James plant, 140,000 kilowatts.	July 1954	400	700	900	35,000	
Unknown	132 kilovolt tower line from Milton plant to Hughes substation in southeastern Ohio, 50 miles.	November 1952	20	200	100		25,000
9000 B	Construct 115/13.8 kilovolt Gary substation at Henry, Wash.	September 1952	0	5	1	3,000	

This listing will not be used in determining individual allotments and in no way replaces the individual project filings required for each major plant addition.

FORM DEPA–1 (REVISION 2)
OCTOBER 1951

FORM APPROVED
BUDGET BUREAU NO. 42–R1121

CLASS I ELECTRIC UTILITY QUARTERLY CONTROLLED MATERIALS REPORT

I. NAME AND ADDRESS OF ELECTRIC UTILITY

SUBMIT ONE COPY BEFORE OCTOBER 29, 1951 TO

DEFENSE ELECTRIC POWER ADMINISTRATION
DEPARTMENT OF THE INTERIOR
WASHINGTON 25, D. C.

II. NAME, ADDRESS, AND TITLE OF PERSON TO CONTACT REGARDING THIS REPORT

III. CONTROLLED MATERIALS RECEIVED 3RD QUARTER 1951 AND REQUIRED 2ND QUARTER 1952

LINE NO.	CONTROLLED MATERIALS (a)	UNIT (b)	MAJOR PLANT ADDITIONS		MINOR REQUIREMENTS	
			RECEIPTS 3RD QTR. 1951 (c)	REQUIREMENTS 2ND QTR. 1952 (d)	RECEIPTS 3RD QTR. 1951 (e)	REQUIREMENTS 2ND QTR. 1952 (f)
1	**CARBON STEEL** (TOTAL – LINES 2 THROUGH 6)	TONS				
2	REINFORCING BAR	TONS			XXXX	XXXX
3	OTHER BAR (INCLUDING LIGHT SHAPES)	TONS			XXXX	XXXX
4	PLATE	TONS			XXXX	XXXX
5	STRUCTURAL SHAPES (HEAVY) & PILING	TONS			XXXX	XXXX
6	OTHER CARBON STEEL	TONS			XXXX	XXXX
7	**ALLOY STEEL** (EXCEPT STAINLESS)	TONS				
8	**STAINLESS STEEL**	LBS.				
	COPPER & COPPER-BASE ALLOYS					
9	BRASS MILL PRODUCTS	LBS.				
10	COPPER WIRE MILL PRODUCTS	LBS.				
11	FOUNDRY PRODUCTS & POWDER	LBS.				
12	**ALUMINUM**	LBS.				

IV. CONTROLLED MATERIALS USED 3RD QUARTER 1951

LINE NO.	CONTROLLED MATERIALS	MAJOR PLANT ADDITIONS (g)	MINOR REQUIREMENTS (h)
13	**COPPER WIRE MILL PRODUCTS**		
14	**ALUMINUM**		

CERTIFICATION: THE ABOVE–NAMED ELECTRIC UTILITY AND THE OFFICIAL EXECUTING THIS CERTIFICATION ON ITS BEHALF, HEREBY CERTIFY THAT THE INFORMATION CONTAINED IN THIS REPORT IS CORRECT AND COMPLETE TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

SIGNATURE OF AUTHORIZED OFFICIAL

TITLE

DATE

IMPORTANT - FILL OUT REVERSE SIDE ALSO

NAME OF ELECTRIC UTILITY

V. REQUIREMENTS FOR INDIVIDUAL MAJOR PLANT ADDITIONS

DEPA SERIAL NO. (i)	BRIEF DESCRIPTION AND LOCATION (j)	IN-SERVICE DATE (k)	2ND QUARTER 1952 CONTROLLED MATERIALS REQUIREMENTS				
			CARBON STEEL (TONS)			COPPER WIRE MILL PRODUCTS (LBS) (o)	ALUMINUM (LBS) (p)
			PLATE (l)	STRUCTURAL SHAPES (HEAVY) & PILING (m)	OTHER CARBON (n)		
TOTAL MATERIALS REQUIRED FOR LISTED PROJECTS. (must be the same as entries for these materials in column (d) of section III)							

REMARKS:

B. Defense Production Administration

This agency assisted in the preparation of the report submitted by DEPA. However, on the following phases of the electric-power program, it prepared its own report, which follows.

DPA REPORT ON CERTAIN PHASES OF THE ELECTRIC-POWER PROGRAM

1. Electric-Power Supply

CURRENT CAPACITY AND REQUIREMENTS

Reports received by the Federal Power Commission from class I electric-utility systems during October 1951 indicate that the electric-power situation on December 31, 1951, is expected to be as follows:

FPC regions	Dependable capacity, Dec. 31, 1951	Estimated peak load, December 1951	Indicated reserves, December 1951	
			Amount	Percent of peak
	Thous. of kw.	*Thous. of kw.*	*Thous. of kw.*	
I	18,624	17,525	1,099	6.3
II	13,545	12,904	641	5.0
III	10,416	11,217	(801)	(7.1)
IV	9,358	8,667	691	8.0
V	5,853	4,949	904	18.3
VI	2,902	2,378	524	22.0
VII	5,002	5,606	(604)	(10.8)
VIII	7,101	6,492	609	9.4
United States total	72,802	69,738	3,063	4.3

The report of the Electric Power Advisory Committee, recently appointed by the Administrator, Mr. Fleischmann, Administrator of Defense Production Administration, to look into the power situation, will probably be available within the next 30 days. This report will comment on the utilities' and the Defense Electric Power Administration's appraisal of the situation and will recommend to the Administrator a power program which will be adequate to meet the needs of the defense effort, maintain a reasonable level of civilian output and, at the same time, be possible of accomplishment within the material limitations which can be expected.

The electric utilities have at present a total of about 3,000 projects under way, of which about 280 are major projects consisting of increase in generating capacity. The others are construction of new transmission lines, substations, etc., or the rehabilitation of existing equipment. Also, because of the increased loading on them, many circuits must be reconductored.

Generating capacity is a convenient yardstick by which to measure utility expansion and at present the generating equipment on order for domestic and Canadian utilities and industrial plants totals 36,702,000 kilowatts. Export requirements of OIT and ECA are 1,850,000 kilowatts, making a total capacity on order of 38,552,000 kilowatts.

About 34,000,000 kilowatts of this amount is for domestic utility systems, and the rate at which it is planned for installation is 9.6 million kilowatts in 1952, 12.2 in 1953, and the balance in future years. Estimates of the national peak load and requirements are:

[In millions of kilowatts]

Year	Peak load	Requirements
1951	68.5	75.2
1952	77.8	85.8
1953	85.2	95.0
1954	90.8	101.2

CURRENT EXPANSION PLANS

During World War II electric-utility construction was held to a practicable minimum, but immediately after the war the utilities, both publicly and privately owned, embarked on a large expansion program. As a general statement, the plans adopted would have doubled by 1954 the generating capacity of the country which existed in 1946 and would have required expenditure of about $16.5 billion for new equipment. Between 1946 and 1951, utilities spent approximately $9 billion for rehabilitation of existing plants and for additions to plant equipment. Since 1946, approximately one-seventh of all the expenditures for new industrial-plant equipment in the United States has been made by the electric-power industry.

The extraordinarily large increase in the use of electric energy after World War II came about more rapidly than the utilities could construct new plants, and by December 1948 the national margin of capacity above load was approximately 6 percent—far smaller than had been experienced at any time in previous years, even during World War I. There were actual shortages in some regions of the country, particularly in California, in the Pacific Northwest, and in the Southeast.

At the present time, several sections of the country are making demands on the supplying systems which are difficult to meet. In September a water shortage necessitated the dropping of load in region 7, but fortunately this was of only very short duration and resulted in the loss of about 2,000 tons of aluminum. In the Pittsburgh area, the utilities curtailing load over the peak-hours every workday resulted in the loss of alloy steel. In the Southeast section of the country the utilities are finding it difficult to meet the load and have, at present, in some regions, a program of voltage reduction during certain hours of the day. If the textile business were operating at its normal output the situation would be even tighter.

In the areas surrounding the Atomic Energy Commission's new plant both in operation and being constructed, practically all of the utilities are hard pressed to deliver temporarily back to the Atomic Energy Commission while the new generating plants to supply it are being built. In California the load growth is far in advance, as is expected for this year, and even though a very large expansion program is under way the utilities are having difficulties in meeting their loads.

Despite the already large expansion program planned for 1947–49, the utility industry had raised its sights and, prior to June 1950, had planned for an expansion of approximately 17 million new kilowatts during the years 1950, 1951, and 1952. In the months between the Korean invasion and the October 1950 meeting of the Electric Utility Defense Advisory Council, the industry had placed additional orders for nearly 5 million kilowatts of generating capacity to be delivered by 1953. Anticipating difficulties in getting equipment at this rapid rate made it very probable that even with this increase in capacity reserve margins throughout the country would dwindle in all regions but one.

Within a matter of weeks following the October 1950 meeting of the Electric Utility Defense Advisory Committee the newly organized Defense Power Administration—now the Defense Electric Power Administration—announced the need for increasing 1953 capacity figures by about 7.5 million kilowatts. This represented about 1.7 times the additional capacity which 1951–52 plans had been designed to provide.

The result of all this was that about 27 million kilowatts of generating capacity were scheduled for production during the years 1951, 1952, and 1953. This is often referred to as the "27,000,000-kilowatt power program." Actually, it is not a program in the sense that the steel, aluminum, nickel, and other programs are. In other words, it is not a plan which was originated and decided on by Government people in Washington and put into effect as a result of the needs of national defense. Power programs are decided on by individual utility owners and the 27,000,000-kilowatt figure is simply the arithmetical sum of the many individual programs of privately owned utilities, Federal Government bodies, municipalities, States, conservation districts, irrigation districts, industrial plants, etc., which could be produced within the time indicated above. Each of these power suppliers decides on and finances his own program. One of the Defense Electric Power Administration functions is to decide on which of these additions to capacity are sufficiently important to warrant allocating materials to them in a particular quarter and to schedule the most critical units in first.

DPA Requirements Committee has, for operating convenience, accepted the recommendations of DEPA on the basis of a 27,000,000-kilowatt increase in capacity. However, the DPA Requirements Committee makes its program determinations on what it regards to be the necessity and desirability for a certain amount of expansion, while taking into consideration, along with many other things, the amounts of material which can be used for that purpose.

The Requirements Committee, in considering the request of DEPA and the Engine and Turbine and Electrical Equipment Divisions of NPA for the supply of controlled materials for quarterly allotment to the power program, tries to take into consideration all possible circumstances. They consider the availability of raw materials to be consumed and processed, the possible substitution of less critical materials for those which are scarcer, limiting the amounts of materials to those which are necessary to normal and abnormal electric-power growth, needs of industrial and special programs like aluminum—which need very large amounts of energy—steel, nickel, airplanes, etc., possible limitations on residential-load growth by restricting the manufacture of household appliances, inventory depletions, and transfers, limitations affecting the installation of power producing and distributing facilities, and such other facts regarding the industry as they are able to use as working tools.

The rate of installation was assumed to be about 7 million kilowatts in 1951, 9.5 million kilowatts in 1952, and 10.5 million kilowatts in 1953. At present it appears likely that about 6.8 million kilowatts of new capacity will be installed this year, a figure slightly smaller than that which would have been installed had it not been for material shortages. The present estimate of 1952 new capacity is something over 9 million kilowatts, after allowing for delay or slippages.

Every effort is being made to assure that at least this much capacity will be "on the line" or "spinning" and to avoid shortages of other necessary equipment such as construction material, structural steel, insulators, transformers, switchgear, or pole-line hardware which might prevent some of these machines from being utilized as soon as they are ready. Obviously, since electric service must be continuous from the generator on into the customers' light bulbs or motors, every piece of equipment necessary to the circuit must be provided and in place before any part of the circuit can be energized. Generators without switch-gear are useless and vice versa. Programs are always being adjusted with this in mind.

ELECTRIC POWER ADVISORY COMMITTEE

Recently DPA Administrator Fleischmann appointed an Electric Power Advisory Committee to make recommendations to him in regard to the size of an electric-power-expansion program which will serve adequately the country's needs for both defense and civilian purposes.

As a groundwork for its recommendations the Committee has requested the Defense Electric Power Administration to collate the latest and best possible information in regard to electric-power requirements and supply from everyone who is concerned with the supply or demand for electric power and energy. The Committee has requested the assistance of DEPA in obtaining from utilities their estimates of power and supply in the geographical areas in which they operate and has requested DEPA to obtain from the Defense Production Administration and National Production Authority their estimates as to the requirements of the defense program and supporting programs and civilian needs.

After it has available the best possible information in regard to requirements and supply needs, the Electric Power Advisory Committee will make recommendations to Mr. Fleischmann as to what it thinks the power program should be. It will, to the best of its ability, evaluate for him risks which might be taken if power is not provided for every need and purpose. The Committee's function is to prepare information for him and assist him in making a decision.

The decision as to the carrying out of the program, its size and its timing, is of course, the responsibility of Administrator Fleischmann.

2. Electric Power for Aluminum

Aluminum requires large amounts of electric energy—approximately 9 to 10 kilowatt-hours per pound. Some of the older plants are of varying sizes and are somewhat less efficient than modern ones. They may require between 11 and 12 kilowatt-hours per pound.

The electric energy used in making aluminum is one of the largest two items in the production cost of the metal; and, as a general statement, production plants are located wherever electric energy can be purchased at the lowest prices. It makes little difference as to the source of the energy—it can be from hydroelectric plants, steam-driven generating plants or internal-combustion-engine-driven generating plants—the important factor being the cost per kilowatt-hour of the energy.

Early production of aluminum in this country was at Niagara Falls, N. Y., Massena, N. Y., and Badin, N. C.—these plants getting their energy from hydroelectric sources. There was little change in this pattern until 1941 when, because additional low-priced power was not available, one producer turned to the gas fields of the Southwest as a source of cheap energy and built a plant which receives its power from both steam-driven and internal-combustion-engine-driven units. Both generating plants use gas as a source of fuel, and the cost of energy on the bus is approximately 3 mills or less per kilowatt-hour.

At this same time, in 1941, additional aluminum-reduction plants were built in the Pacific Northwest because it was possible to obtain a limited supply of hydroelectric energy there at a price of about 2 mills per kilowatt-hour. An additional plant was built at Massena, N. Y., near the one in existence; but, as no more low-priced hydroelectric energy was available, it was necessary to gather up steam energy from sources in the area and transmit it to Taylorsville, N. Y., to Massena over a new line built by the Corps of Engineers.

As no more low-priced hydroelectric power was available in the country, plants were built wherever the amounts of power needed could be obtained; and, as these were located in areas where power was produced from steam-driven sources, it was necessary to pay a higher price for the energy. A plant built at Maspeth, N. Y., obtained energy at the rate of 6.6 mills per kilowatt-hour. The plants at Riverbank and Los Angeles, Calif., paid about 4.9 mills and 6.2 mills, respectively, per kilowatt-hour, and another plant at Burlington, N. J., bought at 6 mills per kilowatt-hour. After the war, all these plants were shut down, as it was not possible for them to compete economically with plants getting power for 2 to 3 mills.

After World War II the Aluminum Company of America built a plant at Port Lavaca, Tex., using internal-combustion engines and this is the first case of a primary producer following such a course in peacetime and without the compulsion of wartime production. Other primary producers are also locating plants in the Southwest turning to gas-fired plants as a source of cheap energy. Some new reduction facilities are being installed in the Pacific Northwest, but at present, the amount of low-cost power available there is somewhat limited.

The present price of aluminum is dependent on the availability of electric energy at about 3 mills per kilowatt-hour. The producers say that anything above this would necessitate a price increase. Aluminum's competitive position at present is excellent, with the copper supply being more or less limited, and with the greatly increased demand for aluminum for use in many fields, its prospects are very bright.

Finally, price is the primary consideration when purchasing electric energy for use in making aluminum. The producers do not care what the source of the fuel is—hydro, coal, gas, lignite, oil, or anything else. Their need is for large amounts of electric energy at the lowest possible prices and they will locate reduction plants wherever they find the combination of large, adequate supplies of energy at low prices.

C. National Production Authority

This agency also collaborated with DEPA in preparation of the report submitted by the latter. However, in addition, it submitted this separate report discussing NPA actions in aiding DPA in reaching a decision on allotments of controlled materials required for the production of electric power.

1. Report on Allotments of Controlled Materials Usable in Electric Power Program

Department of Commerce,
National Production Authority,
Washington 25, November 28, 1951.

Mr. William F. McKenna,
Counsel, Joint Committee on Defense Production,
Senate Office Building, Washington 25, D. C.

Dear Mr. McKenna: In accordance with your request, there is submitted herewith additional information concerning allotments of controlled materials for electric power equipment, consisting of (1) a table showing allotments of steel, copper, and aluminum for generating equipment for the third and fourth quarters of 1951 and the first quarter 1952, and advance allotments for the second and third quarters of 1952; and (2) a table summarizing orders for generating equipment, in terms of kilowatt capacity, on the heavy power equipment manufacturers' order boards scheduled for delivery after November 1, 1951. This second table shows the breakdown of orders for the DEPA program, the domestic, industrial program (including the Canadian Division), and the foreign program.

While there are no figures available showing exactly how much of each quarterly allotment of materials goes into equipment for the DEPA program as distinguished from the other programs, an estimate can be made by assuming that it bears approximately the same ratio to the total alloments as the ratio of scheduled orders for equipment for DEPA program bears to the total of scheduled orders for all programs or in the neighborhood of 87 percent.

If I can be of any further assistance, please let me know.

Sincerely yours,

John G. Alexander, *General Counsel.*

Controlled material allotments for power equipment by quarters in tons

	Steel	Copper	Aluminum
Third quarter 1951: Includes generators above 2,000 kilowatts; boilers; condensers and heaters; internal combustion; steam engine and turbine; stokers	226,003	5,161	900
Fourth quarter, 1951 (same as third quarter, 1951)	237,674	4,727	921
First quarter, 1952 (same as third quarter, 1951)	244,760	5,356	764
Second quarter, 1952 advance (same as third quarter, 1951)	143,973	1,791	317
Third quarter, 1952 advance (same as third quarter, 1951)	121,474	1,484	300

Summary of orders for steam, hydro, and Diesel generating equipment on the heavy power equipment manufacturers' order boards scheduled for delivery after Nov. 1, 1951

	Steam	Hydro	Diesel	Total
	Kilowatts	*Kilowatts*	*Kilowatts*	*Kilowatts*
DEPA	26,137,000	7,487,000	115,000	33,739,000
Domestic, industrial (including Canadian Division)	2,118,000	110,000	735,000	2,963,000
Total, United States of America and Canada	28,255,000	7,597,000	850,000	36,702,000
OIT and ECA	1,138,000	629,000	83,000	1,850,000
Total, foreign	1,138,000	629,000	83,000	1,850,000
Grand total	29,393,000	8,226,000	933,000	38,552,000

Marine backlog (in addition to above):
(*a*) Main propulsion ..... horsepower 1,607,360
(*b*) Turbo-generator sets ..... kilowatts 119,000

2. Allotment Procedures for Power Equipment

Items known as power equipment are divided between the Electrical Equipment Division of NPA and the Engine and Turbine Division of NPA. The Engine and Turbine Division of NPA is responsible for heavy power equipment

items such as boilers, stokers, steam turbines, hydro turbines, generators, condensers, and Diesel engines. The Electrical Equipment Division is responsible for such items as transformers, pole line hardware, and high-voltage distribution equipment.

PROCEDURES IN THE ENGINE AND TURBINE DIVISION

A brief outline of the operation of the Engine and Turbine Division is as follows: Requests from manufacturers for materials are analyzed by the product specialists for essentiality, reasonableness, and proper application of various materials, after which they are recorded not only by products but by composition, structural shapes, and sizes of materials. Should improper use of controlled material or improper quantities be indicated, or if sufficient information is not submitted with the request, such requests are either reviewed with the originator or revised in accordance with the knowledge and experience of the specialists. After each section is satisfied that the requests have been screened to a reasonable and proper level and that they are in accordance with the general program orders of NPA, the requests are tabulated by materials and recorded by sections or products.

The total amount of each material is obtained by adding the requirements of each section, which gives the total indicated requirements of the Division, both by product codes and material. The resulting estimate by product codes and classification of material is submitted to the DPA Requirements Committee by the Division as claimant for the manufacturers. After the DPA Requirements Committee allocates the material to the Division as a whole, the Division distributes it to the sections on the same percentage basis as the stated requirements by the Division bear to the actual material received, with proper regard to manufacturing schedules for major projects, and direct defense needs. A reserve of 3 percent is held for late cases, supplementary applications, and correction of errors in original applications.

The DPA allotment of material is then tabulated by products and classifications of material and submitted to the Division Requirements Committee, which is composed of the various claimants. At this meeting the various claimants check the allocation of the total material available to the Division for proper distribution and each has an opportunity to concur or suggest changes in the distribution. When all interested parties agree that what material is available is fairly distributed among product codes, the Division processes all requests received and attempts to make an equitable distribution among the manufacturers. In this connection, the product codes which have to do with the power program must be scheduled to insure an orderly flow of material to the projects under way in accordance with the needs. This scheduling is aided by what is known as an order board submitted monthly by each manufacturer, in which he lists monthly pertinent data on each customer order received and in the order of receipt. Included in these data is the scheduled delivery—assuming that the necessary material will be made available to him for uninterrupted progress of the manufacturing cycle. This procedure enables the Engine and Turbine Division to inspect the order boards of the various manufacturers involved in furnishing component parts of a major project and coordinate the completion of manufacture. This is most difficult due to the extremely long lead time required for manufacturing heavy equipment such as turbines which require 2 years or more to complete. No distinction is made between industrial, privately owned, or publicly owned utilities in our procedure. By means of the order board, the Engine and Turbine Division can coordinate very closely the flow of material within the limits of availability.

The basic plan for implementing a program to meet power needs is largely patterned after the plan that proved so successful during World War II. It provides for a review of construction schedules and power needs and programs for meeting such power needs by competent expert personnel on the Government's staff within the mobilization agencies.

In conclusion, there is no differentiation in the procedure in the processing and scheduling industrial and public utility plants. This Division depends on information supplied by its claimants as to the relative urgency of the various projects and governs its scheduling accordingly.

On page 48 is a table showing the quantities of each controlled material allotted to the power equipment items handled by the Engine and Turbine Division for the first quarter of 1952.

PROCEDURES IN THE ELECTRICAL EQUIPMENT DIVISION

In processing CMP 4B applications from manufacturers, the general procedure followed by the Electrical Equipment Division is essentially as follows:

1. The individual manufacturer's application is reviewed to determine whether or not he is requesting excessive amounts of material in relation to his dollar shipments and to discover whether the amounts of the various material shapes requested are in balance.
2. All of the 4B applications are tabulated within a product code.
3. A breakdown is established of the applicant's estimated military and nonmilitary shipments.
4. A manufacturer is allowed sufficient materials to produce at a rate of 90 percent of his screened military requirements.
5. The level of the nonmilitary requirements is established with the Division Requirements Committee composed of the representatives of all the claimants, in relation to the importance of the product involved and to the materials made available for all programs.
6. No manufacturer is permitted to expand his nonmilitary production at a rate greater than the average rate of expansion for the industry determined by the base period; i. e., the last half of 1949 and the first half of 1950.

There may be individual variances when a manufacturer can conclusively demonstrate the need for an expansion greater than the normal rate of the industry. As an example, a given manufacturer may be producing products acutely needed and peculiar to his own type of construction. While this particular product may not be procured directly by the military, it may be urgently required in conjunction with military or AEC installations.

After consultations with the services involved, it may be necessary to make available additional materials to one or more manufacturers to accomplish the production of vitally needed equipment.

The following schedule shows the quantities of controlled materials allotted to pole-line hardware, transformers, and high-voltage distribution equipment to the first quarter of 1952:

	Carbon steel	Alloy steel	Stainless steel	Copper, brass mill	Copper, wire mill	Copper, foundry	Aluminum
	Tons	*Tons*	*Thousands of pounds*	*Thousands of pounds*	*Thousands of pounds*	*Thousands of pounds*	*Thousands of pounds*
36113 Pole line hardware	33,811	537	167	837	153	491	2,336
36151 Transformers	41,660	41,746	133	2,869	28,574	600	396
3616192 High-voltage distribution equipment	18,155	490	205	5,673	929	3,659	906

Engine and Turbine Division—Actual distribution of Division allocations, first quarter, 1952

		Carbon steel			Alloy steel	Stainless steel	Copper			Aluminum
		Carbon	Plate	Structural			Brass mill	Wire mill	Foundry	
		Tons	*Tons*	*Tons*	*Tons*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Total stated requirements GA–45										
Percentage granted										
Total allocation granted		523, 500	225, 000	37, 000	50, 000	14, 000, 000	24, 000, 000	1, 830, 000	4, 100, 000	3, 900, 000
Division reserve		15, 705	6, 750	1, 527	1, 521	400, 000	719, 840	54, 900	122, 871	101, 166
Additional allocations received (NPA reserves, Form 53, etc.)										
Total allocations received										
Balance for distribution by product codes		507, 795	218, 250	35, 473	48, 479	13, 600, 000	23, 280, 160	1, 775, 100	3, 977, 129	3, 798, 834
ALLOTMENTS TO INDUSTRY BY PRODUCT CODES										
34433	Power boilers	140, 151	40, 158	21, 713	14, 676	3, 517, 220	235, 800	46, 153	222, 712	892, 788
3568092	Mechanical stokers	2, 539	218	359	197	40, 740	20, 280	1, 775	23, 862	3, 783
3511	Steam turbines and generators	20, 820	11, 131	287	19, 497	4, 379, 180	721, 680	704, 715	580, 642	155, 103
3511	Hydraulic turbines	9, 140	3, 056	380	207	176, 540	70, 000	1, 775	206, 804	3, 783
3614292	Generators over 2,000 kilowatts	8, 633	3, 929	36	3, 201	33, 740	977, 760	924, 827	43, 747	23, 500
35691	Steam condensers	8, 125	6, 329	431	66	47, 740	4, 399, 920		71, 586	
35691	Heat exchangers	33, 514	15, 278	682	1, 794	2, 159, 220	15, 527, 760	28, 401	1, 308, 433	1, 233, 233
3569111	Feed water heaters	2, 031	1, 964	35	28	162, 960	69, 840		10, 958	
3519	Internal combustion	19, 804	3, 928	215	2, 958	176, 540	325, 920	47, 928	1, 065, 836	1, 051, 674
3589291	Water treatment	6, 601	3, 055	173	84	108, 640	582, 000	3, 550	393, 723	56, 607
35920	Fabricated pipe	22, 851	437	323	4, 122	611, 100	186, 240		5, 079	35, 363
34431	Boiler shop products (tanks)	233, 586	128, 767	10, 839	1, 649	2, 186, 380	162, 960	15, 976	43, 747	343, 000

3. PROCEDURES FOR ALLOCATION OF COPPER FOR POWER TRANSMISSION LINES

The Copper Division of NPA is a controlled materials division having three controlled materials under its jurisdiction, namely:

(1) Copper wire mill products.
(2) Copper and copper-base alloy brass mill products.
(3) Copper and copper-base alloy foundry products.

Within the Division there is established a Wire Mill Branch, a Brass Mill Branch, and a Foundry Branch, staffed with competent people familiar with the problems of the industry involved.

The Copper Division does not allocate controlled materials to the Defense Electric Power Administration nor to any other claimant agency. This is the full responsibility of the Requirements Committee of DPA. The Copper Division estimates the quarterly available supply for each of the three controlled materials coming under its jurisdiction. This information is given to the Requirements Committe and the program staff of DPA with a request that these figures be used as a basis of their allotments of controlled materials. The Copper Division attends meetings of the Requirements Committee and Program Adjustment Committee of DPA, not to approve or disapprove any suggested allotment to the claimant agencies involved, but merely to assist DPA from an operating standpoint in saying whether or not a particular program is feasible from a mill facility and specification point of view.

After the allotments are made by the Requirements Committee of DPA to claimant agencies, it then becomes a responsibility of the Copper Division, through its three controlled material branches, to arrange for the delivery of the controlled materials to the claimant agencies involved. In doing this, the Copper Division is limited by the supply of refined copper, copper-base alloy scrap, zinc, and lead needed to produce up to the original estimate of the Copper Division of the available supply of the three controlled materials. The Copper Division is in effect the manufacturing department. It does not say to whom the controlled materials shall be delivered nor the amounts to be delivered to the various claimant agencies. The Copper Division has a supply of raw materials. It has jurisdiction over fabricating plants with facilities far in excess of the supply of raw materials. If the orders reaching the mill do not exceed the Copper Division estimate of supply as given to DPA, and provided no work stoppages take place, then programs will all be fulfilled within a given quarter.

With particular reference to the allocation of copper wire for power transmission lines, the Copper Division has consistently cooperated with DEPA in making available the amount of copper controlled materials required by the program determination issued by the Requirements Committee of DPA to DEPA.

In order to make controlled materials available for the authorized programs of the claimant agencies, it has become necessary for the Copper Division to allocate all copper raw materials to the various controlled material producers. The mechanics for this has been set up under NPA Order M–16. Before any allocations of copper raw materials (refined copper, copper and copper-base alloy scrap, and copper and copper-base alloy ingot) can be made, it is necessary to divide the raw material supply that will be available among the three branches of the Division. This is accomplished basically by determining the impact of authorizations issued pursuant to the controlled materials plan on each of these branches and splitting the available raw material supply so as to see that there is sufficient to fit, as near as possible, all the requirements of the program determinations issued by DPA. The apportionment of the raw materials among the three branches is, of course, also limited by the fact that all materials are not useful to all the branches. For example, the wire mills cannot use scrap, whereas the brass mills can use certain grades of scrap, and the foundries can use most scrap. Once the division among the three branches has been made, the available materials are divided among the controlled material producers in accordance with a historic pattern established prior to June 30, 1950. Controlled material producers apply monthly (except in certain minor cases where quarterly or semiannual applications suffice) for allotments of copper raw materials pursuant to NPA Order M–16, and these allotments are made in an attempt to preserve the relative position of all segments of the industry. Every endeavor is also made to see that the allotments made to the controlled material producers are fulfilled. No overallotments of refined copper are made. Unfortunately, the uncertainty of the scrap situation has made it impossible to say the same with regard to this material. It should

be pointed out, however, that the copper wire mills use refined copper and, therefore received the full amounts of raw materials allocated to them by the Copper Division.

Almost all the power transmission program, insofar as its use of copper is concerned, comes under the Wire Mill Branch of the Copper Division. The electric wire and cable industry has for years considered the power and light systems very important customers. To this extent they are in a favorable position, and the copper wire mills themselves have endeavored to see that all authorized controlled material orders from this industry are met. Direction 2 to M–11, which gave authorized controlled material producers a certain amount of leeway in selecting which authorized controlled material orders would be scheduled, has, we understand, resulted in the wire mills reserving definite production space for orders from this industry. The Wire Mill Branch of the Copper Division is in constant touch with the Materials Division of DEPA. Assistance has been offered and is being given to straighten out specific difficulties. Recently the electric wire and cable industry has had some difficulty in obtaining the necessary supply of lead in order to meet certain specific types of requirements for DEPA, namely, paper-insulated and lead-covered power cables. The Copper Division, in conjunction with the Administrator's office, the Tin, Lead, Zinc Division, and Metals and Minerals Bureau, was able to correct the situation to a great extent. It is the duty and responsibility of the Copper Division to work on problems of this type in order that the authorized controlled material orders accepted by the mills from power and light systems and from other controlled material users can be fulfilled.

To the extent that the limited quantity of raw materials permits, the Copper Division will continue to try to see that all controlled material orders authorized by DEPA are shipped. However, as previously pointed out, the quantities of such materials allocated to DEPA for distribution among the power companies is determined by DPA and not by the Copper Division of NPA.

4. Procedures for Allocation of Aluminum for Power Transmission Lines

The Defense Electric Power Administration is charged with determining the requirements of copper and/or aluminum electrical conductor to distribute power and electricity. As a claimant agency for these controlled materials, this agency determines the requirements of the various utilities and REA for each quarter. These requirements are then submitted to the Requirements Committee of DPA. A representative or representatives of DEPA attends the necessary sessions of the DPA Requirements Committee. The DPA Requirements Committee makes the allocations to the various claimant agencies of which DEPA is one.

After DPA announces the final program determination and the allotments for the various programs, DEPA advises the Aluminum and Magnesium Division of NPA of such allotment and the pounds, shapes, and forms DEPA will allot to the various utilities and REA. This is given to the Aluminum and Magnesium Division in terms of pounds ACSR (aluminum conductor, steel reinforced), pounds of bus bar and pounds of covered wire to be fabricated in aluminum. The Aluminum and Magnesium Division allots this material to the aluminum producers and independent fabricators (cable stranders) and issues production directives accordingly.

This allocation or distribution of the program to produce fabricated electrical conductor is made using the year 1950 as a base period of the producers and independent fabricators.

In the original determination of the allotment formula the whole year 1950 was chosen as it gave the independent fabricators a slightly larger share of this business than the three large producers. Production directives are issued against the producers of redraw rod in favor of the independent fabricators to assure them of getting the supply of material needed to make the cable allotted to them.

For example, General Cable Corp. (an independent fabricator) produced 6.68 percent of all ACSR in 1950 and, therefore, would be provided with redraw rod required to fabricate 6.68 percent of the total amount allotted to DEPA in any given quarter.

DEPA controls the distribution of this aluminum controlled material by administration of H3 and H4 ratings. This authority is delegated DEPA by NPA Order M–50. More than one-tenth of primary aluminum production has been utilized as electrical conductor in 1951. In this connection, more miles of ACSR for power transmission will be used than its copper equivalent during 1951.

D. Munitions Board

The Munitions Board, primarily concerned with direct military requirements, has submitted the following report on electric power.

Munitions Board,
Washington 25, D. C., November 6, 1951.

Memorandum for the Joint Committee on Defense Production.
Subject: Electric Power Shortage.

1. Electric power supply is a factor in basic industrial production rather than in end-item production of the type with which the Defense Department, through the Munitions Board and the military services, is more directly concerned. So far as actual military facilities are concerned, the current power shortage has not been so acute that they have been unable to secure their power requirements. Hence, our national power supply has been and is basically an industrial problem handled more by the mobilization agencies under the Office of Defense Mobilization than by the Department of Defense; and more detailed information on the question should come from those agencies. In general, raw material requirements as submitted to them by the Department of Defense do not include requirements for electric power necessary for processing.

2. However, the Department of Defense obviously has a very real though indirect interest in the general level of American production. It therefore has an equal interest in the power supply upon which depends, in particular, the vital American production supplied by the electro-chemical and electro-metallurgical industries.

3. Of these latter industries the Department of Defense is probably most directly interested in aluminum production. In connection with the expansion of basic industrial production facilities, such as aluminum, the plants themselves can be and have been expanded more rapidly than facilities for generating electric power. Hence, in the initial stages of an emergency expansion such as the present one, a short-run power shortage of some sort is almost inevitable. It has been in anticipation of this shortage that the Munitions Board has for many years actively supported power expansion measures pending before Congress. But despite these efforts, the almost inevitable shortage does exist. Approved practice in the power industry is to have a 15-percent reserve of generating capacity above demand at peak load. Starting with the rapid defense expansion late in 1950, the Nation-wide power reserve has dropped below this figure. Partially due to the recent water shortage, this reserve has fallen to a minus quantity in some areas, particularly the Pacific Northwest, where approximately 50 percent of our aluminum production is located, and the Southeast, scene of recent atomic energy expansion. In general terms it has been estimated by the Government and the Edison Electric Institute that demand will increase about 33 percent during the period 1951–53 to a peak load in 1954 of approximately 87 million kilowatts.

4. Nevertheless, there does not appear to be a serious danger of an acute long-range power shortage resulting from the increased long-range requirements. In general, the power expansion program has been stepped up considerably. For example, it had been previously estimated that the country's generating capacity would be increased about 30 percent during the period 1951–53, whereas current estimates for the same period now run above 40-percent expansion to a national capacity of over 100 million kilowatts by the end of 1954. By 1955 some of the larger power-generating projects now under construction will be far enough along so that they can add substantially to the supply of energy. The fact that it takes 5 to 6 years to bring a large generating facility on the line is all the more reason to commence their construction as soon as possible to meet the normal growth in civilian power demands as well as to meet the increased defense requirements. For this reason Congress, at an early date, should consider authorization for the St. Lawrence seaway and additional power projects in areas such as the Northwest and Southeast.

5. In commenting on the long-range power picture, it should be noted that it is difficult to predict the actual extent of possible power shortages because power generating and its use take place simultaneously. For example, if an additional million kilowatts were made available in the Pacific Northwest today, the industrial plant to use it would undoubtedly be built quickly and would undoubtedly absorb that amount of additional power. Consequently, while from the military point of view it does not appear that there will be a critical

power shortage so long as materials continue to be made available for current and planned construction, on the other hand, there would not appear to be the slightest possibility of a power surplus for the foreseeable future and every kilowatt of additional power will undoubtedly be used as soon as it is made available.

ALFRED L. SCANLAN,
Assistant Counsel.

E. ATOMIC ENERGY COMMISSION

The following brief but pertinent forecast was received from the Atomic Energy Commission in response to a request from your committee:

ATOMIC ENERGY COMMISSION,
Washington 25, D. C., November 9, 1951.

Mr. WILLIAM F. MCKENNA,
Staff Assistant, Joint Committee on Defense Production,
Congress of the United States.

DEAR MR. MCKENNA: In reply to your letter dated October 25 concerning the possibility of adding controlled atomic fission to our major sources of energy in the near future, we cannot be very encouraging. While there is some promise that nuclear reactors will supplement conventional power plants in supplying the growing needs of our civilian population within the next decade or so, we cannot foresee that the use of nuclear sources will provide any alleviation of the shortages to which you refer before the end of 1953.

Sincerely yours,

UNITED STATES ATOMIC ENERGY COMMISSION,
H. D. SMYTH, *Acting Chairman.*

F. FEDERAL POWER COMMISSION

The Federal Power Commission submitted the following report on its activities concerning interconnection of electric power systems. The attachments to which reference is made in the Commission's letter are not reprinted in this report because of their length. However, they have been preserved in the files of your committee for reference purposes.

FEDERAL POWER COMMISSION,
Washington, D. C., January 8, 1952.

Hon. BURNET R. MAYBANK,
Chairman, Joint Committee on Defense Production,
United States Senate, Washington, D. C.

DEAR SENATOR MAYBANK: This is in response to your letter of December 14, 1951, requesting a general statement concerning the Commission's activities in administering the provisions of sections 202 (c) and 202 (d) of the Federal Power Act and in addition our comments on certain proposals made to your committee by five State commissions concerning the same subject matter, which you attached.

The sections of the act to which you refer deal with the Commission's authority to direct, order, or approve interconnections of facilities and the transmission of electric energy when emergency situations arise in the electric power industry. But we think it is appropriate to call attention to the many years of preparatory work for action under these sections which has been carried on by the Commission's staff under section 202 (a) which reads as follows:

> "SEC. 202. (a) For the purpose of assuring an abundant supply of electric energy throughout the United States with the greatest possible economy and with regard to the proper utilization and conservation of natural resources, the Commission is empowered and directed to divide the country into regional districts for the voluntary interconnection and coordination of facilities for the generation, transmission, and sale of electric energy, and it may at any time thereafter, upon its own motion or upon application, make such modifications thereof as in its judgment will promote the public interest.

Each such district shall embrace an area which, in the judgment of the Commission, can economically be served by such interconnected and coordinated electric facilities. It shall be the duty of the Commission to promote and encourage such interconnection and coordination within each such district and between such districts. Before establishing any such district and fixing or modifying the boundaries thereof the Commission shall give notice to the State commission of each State situated wholly or in part within such district, and shall afford each such State commission reasonable opportunity to present its views and recommendations, and shall receive and consider such views and recommendations."

The Commission has conducted many surveys and made recommendations which have been put into effect under this section of the act prior to and during World War II and has continued such surveys in anticipation of the requirements of the defense program. Most of this work has been done on the Commission's own initiative but some of the surveys now under way are being made for and in cooperation with the Defense Electric Power Administration.

An example of a staff study under section 202 (a) which led to action under section 202 (d) was an interconnection possibility between Public Service Co. of Northern Illinois and Wisconsin Electric Power Co. In December of 1950, the staff completed a report on the merits of this interconnection and upon finding it desirable in meeting the present power supply emergency in the northern Illinois region, the Commission referred the report to the utilities and States concerned for an expression of their views. Favorable reports were received from all parties and the Commission was prepared to act under section 202 (c), but in the meanwhile the companies voluntarily requested action under section 202 (d). An order authorizing the connection was issued November 7, 1951. A copy of the staff report and of the Commission's order is attached.

Examples of other studies of this type being carried on under section 202 (a) are: (1) An interconnection between the Columbia River power systems in the Northwest and the systems of northern California, and (2) an interconnection between the power systems in the States of Oregon and Idaho to permit transfer of steam-generated electric energy from Utah into the Northwest region where the energy is produced by hydroelectric generation and the shortage of power is serious. Copies of these reports are attached for your information. The California-Oregon report (item (1)) was furnished to DEPA, the Bonneville Power Administration, and the utility systems involved, for their comments. No action has as yet been taken. The study under item (2) was initiated by the Commission early this year, but the attached report was pointed up particularly to meet a request of DEPA for an early expression of the Commission's views on the feasibility of the connection.

Over the years, since the passage of the Federal Power Act in 1935, the Commission has carried on as a part of its regular work many similar studies of all parts of the country. The information developed from these studies furnish the basis for prompt action on the applications the Commission receives from the industry under section 202 (d) and prepares the Commission for action when necessary under section 202 (c). It should be noted further that by referring these reports to the interested parties a great many of the interconnection possibilities proposed by the Commission's staff have been accepted and voluntarily adopted and put into effect by the electric utilities themselves, thus reducing the need for Commission action under section 202 (c). The Commission considers its work under section 202 (a) to be one of its most important functions in bringing about a stronger, more dependable, and efficient power supply for the Nation.

Such studies as referred to above are being made in cooperation with DEPA as part of an agreement with that agency on coordination of our activities and the gathering of information needed by that agency in administering its responsibilities for assuring a power supply for the defense program. A copy of the agreement is attached. Under the provisions of the Federal Reports Act (administered by the Bureau of the Budget), the Federal Power Commission is considered to be the normal channel through which power industry information is gathered, both in peace time and in times of emergency. This agreement assures such continuity and necessary coordination in meeting DEPA's requirements.

The Commission has comprehensive files on the facilities and operations of electric power systems throughout the country. To the extent that certain special types of information are now needed by DEPA in handling defense power problems, special solicitations are being made by the Commission for that agency. This information is analyzed and developed in a form readily usable by the

defense agencies. Although DEPA is the defense agency more directly concerned with power problems, similar assistance is being rendered to other agencies, namely: Defense Production Administration, National Security Resources Board, Munitions Board, Departments of the Air Force, Army, and Navy, Bureau of the Budget, and others. Special reports on defense matters are also made for committees of Congress.

Regarding the proposals made to your committee by the five-State commissions we wish to make the following comments:

The Commission has recognized that the National Defense Program has created emergency conditions on many electric utility systems and has promptly issued specific orders pursuant to section 202 (d) where necessary to alleviate these conditions and will continue to do so.

It should be noted that public utilities subject to the Commission's jurisdiction need no authority from the Commission to make or maintain interconnections with other utilities for emergency purposes or otherwise. As for utilities not otherwise subject to the Commission's jurisdiction section 202 (d) provides that they may make such temporary interconnections and transmit electric energy in interstate commerce as may be necessary to meet an emergency without becoming subject to the Commission's jurisdiction and upon approval of the Commission may maintain permanent connections for emergency use. However, it should be kept in mind that section 202 (d) is confined to emergency operations and not intended to exempt utilities conducting operations in interstate commerce common to the electric utility industry such as interconnections between two systems for mutual benefit. To apply section 202 (d) to the latter operations would practically nullify the intent of Congress as expressed in the Federal Power Act to regulate electric utilities operating in interstate commerce.

In conclusion we wish to emphasize that as a result of our past experience with electric power emergency situations throughout the country we feel that sections 202 (c) and 202 (d) of the act are adequate to enable the Commission in its regulatory function to cope with emergency conditions arising from the ordinary operations of the electric utility industry as well as those resulting from the defense program.

Sincerely yours,

THOMAS C. BUCHANAN, *Chairman.*

PART 3. REPORTS FROM NATIONAL AND REGIONAL ASSOCIATIONS INTERESTED IN ELECTRIC POWER INDUSTRY

In the interest of obtaining data on the electric power program from organizations closely connected with the operation of that industry, your committee extended invitations to some 36 representative national and regional associations to comment on the subject matter of the study undertaken by your committee.

Of the many responses received, the following excerpts bear directly on problems discussed in this report.

Mr. C. B. McManus, former Administrator of DEPA, in his capacity as president of Southeastern Electric Exchange, made the following comment:

> As you know, the load in the Southeastern States has grown at a very rapid rate, and the various power companies fully recognize their responsibility and have made extensive plans for taking care of this future growth. The principal thing worrying all of these companies is their inability to obtain material to complete their planned construction on schedule. In general, I think that if they can obtain this material on schedule, the load in this area can and will be adequately served. There are, however, a number of generating installations that are being seriously delayed on account of the lack of structural steel.

Similar sentiments were expressed by the Missouri Valley Electric Association, which said:

> All companies in our area have planned their construction program for some years in advance and have placed orders for the necessary equipment and apparatus for constructing these facilities, to meet the foreseeable demands for electric service in this area. They are especially concerned, however, over threatened delays in the delivery of this equipment, particularly large power transformers and generating equipment. If such delays do develop, our companies would be prevented from having this planned capacity available when needed, which might result in a deficiency in power supply from causes beyond their control.

From the Rocky Mountain Electrical League came this statement:

> The majority of our various public and private utility members have very extensive programs of adding electric generating capacity to meet the growing power requirements of this area. From my information, there will be no power shortage in this area provided that allocations of critical material to the electric manufacturing and the electric utility industry by the NPA are sufficient to meet construction requirements.
>
> Located in our area are many vital military and defense projects. Extensive operations of the Atomic Energy Commission are located in this area, together with numerous proving grounds, air bases, ordnance depots, and arsenals. The area also contains many important governmental agencies employing thousands of people. All of this activity has developed a rapid growth of population, resulting in an abnormal increase in electrical requirements. It is, therefore, urgent that the electric utilities of this area receive sufficient allocations of critical materials in order that they may proceed with their construction programs as authorized by the Defense Electric Power Administration.

The Southern California Edison Co. sounded a warning concerning difficulties it is encountering in attempting to construct on time its new Etiwanda steam generating station. It said:

Construction of Etiwanda steam station commenced in March 1951. Although some difficulties have been experienced in the procurement of controlled materials, the project with the assistance of the Defense Electric Power Administration and the National Production Authority, has been kept substantially on schedule up to the present time.

In September of this year, difficulty was experienced in placing orders for steel plate and structural steel for Etiwanda and appeals were filed with DEPA and the Munitions Board for procurement assistance. * * * It is entirely possible that similar difficulties may hamper the delivery of other materials, not only for Etiwanda steam station, but for other major electrical distribution facilities.

If these delays do come about, and the company were to be unable to service these defense load customers, it would be the result of the failure to allocate sufficient controlled materials to the electrical industry. The effect of such a curtailment to the rearmament program would be deplorable. * * *

The various enclosures demonstrate the fact that the Southern California Edison Co. and other electric utilities have planned, engineered, financed, and scheduled their power expansion program to meet the anticipated demands of the defense program and allied industries. Inability to carry on this program, and to complete on schedule projects such as Edison's Etiwanda steam station, would be a direct result of a failure to recognize the seriousness of the situation and to correct immediately the existing inequities of controlled materials allotments.

The American Public Power Association endorsed the December 6, 1951, statement of Administrator Fairman of DEPA warning of the danger of a power shortage. Stating that its member systems throughout the country, consisting primarily of municipally owned systems, are actively engaged in programs to increase their power supply, the association concluded:

In view of this situation, our recommendations to your committee are threefold:

1. Because of the vital defense-supporting nature of the electric power industry, we respectfully request that your committee urge the Defense Production Administration to give full support to the Defense Electric Power Administration's power program by making available to the electric industry critical materials in amounts sufficient to carry forward the DEPA power program without further slippage.

2. Because of the considerable lead-time which is required in the construction of hydroelectric projects, we urge that the Congress give continuing consideration to the orderly development of our Nation's hydroelectric resources, so that the economically feasible projects may be brought into production at the earliest practicable time. Such renewable resources should be harnessed with the least possible delay.

3. We note with considerable regret, through press reports, that at least one State regulatory commission has injected the private versus public power issue in its comments to your committee. At a time when power supplies from all sources are urgently needed for our national security, we believe such an action by a State regulatory commission or any other group is untimely and reprehensible. Neither public nor private power groups should attempt to block the efforts of the other during this emergency period. We believe that support should be given to the private power companies wherever necessary, and at the same time we strongly advocate that these companies abandon their fight on the public systems during this national emergency, so that both public and private systems can make the maximum contribution to our mobilization program. Such a policy, we believe, is clearly in the national interest.

Because it was the only organization replying from the standpoint of rural needs for electric power, there is included at this point the comments of the National Rural Electric Cooperative Association

made on its behalf by its executive manager, Mr. Clyde T. Ellis. The association notes that 863 systems are members of this service organization of the rural electric systems of the United States, and that it has a consumer membership of approximately 3,000,000 farm families in 42 States and Alaska.

Mr. Ellis stated:

The farmers of America have been asked to produce more food and fiber than ever before in history. Tremendous quantities of these raw materials are needed to feed and clothe the Armed Forces and civilian populations of nearly every nation fighting against totalitarian aggression. These agricultural production goals must be achieved despite the fact that farm labor is being siphoned into more lucrative industrial jobs and into the Armed Forces. This manpower loss must be compensated for by more intensified use of machinery on the farm. The term "farm machinery" no longer denotes a gasoline tractor and its associated apparatus, but includes a myriad of electrically driven equipment. Such items as barn cleaners, silage elevators, feed grinders and dryers, milking machines, water pumps, and automatic brooders, are examples of electrically driven, labor-saving machinery used on the farm. If this machinery is to prove really productive, it must be employed on a large scale, operate efficiently, and be available when needed. An adequate source of reliable electric power must be available at all times.

Some 2½ million farms in the United States receive central station electric service from rural electric cooperatives and power districts, local autonomous farmer owned electric distribution systems financed on a self-liquidation basis by the Rural Electrification Administration. Last year (1950), these cooperatives purchased 7½ billion kilowatt-hours of energy at wholesale for distribution to farms and other rural establishments, some 4 billion of which they bought from commercial power companies. At the present time, the cooperative loads are doubling every 5 years and would increase even more rapidly were abundant wholesale energy available. Thus, by 1960, if present trends continue, the cooperatives may require 30 billion kilowatt-hours for their consumers. Of this amount, about 16 billion kilowatt-hours will be required of the power companies compared with 4 billion kilowatt-hours purchased from such companies last year. The experience of the cooperatives indicates that many of these companies may not be in a position to meet this increased load. Such inability will be manifest in poor voltage regulation at cooperative substations, excessive periods of outage, limited transmission line capacity, and rate structures that discriminate against large farm loads.

Last year, while the power companies were appearing before committees of the Congress, reiterating with the aid of elaborate charts and graphs the fact that they were willing and able to serve all loads, 19 percent of the rural electric distribution systems were already handicapped by an existing shortage of wholesale power. Twenty-one percent of the systems had insufficient power to meet anticipated load growth. These figures are not guesses. They are results tabulated from an annual survey conducted by the rural electric cooperatives of the country through their national association.

The electric power shortage is an old story to leaders of rural electric systems. Wherever and whenever these leaders have met during the past 5 years, they have spoken of their increasing demands for electric service and methods of meeting these demands from the meager sources of energy made available to them. Time and time again they have called to the attention of the Congress and the public existing and threatening power shortages in many parts of the country. But in almost every instance, our efforts to point out weaknesses in the electric power reserves of the country were met by loud denunciations from the power companies. The power shortage which farsighted men have been predicting for years is no longer problematical. It is with us in the form of interruptions to aluminum production as well as the inability of industry to locate any applicable block of power anywhere in the United States for expansion purposes, defense, or otherwise. The elaborate plans of proposed generation plants and the multicolored maps of planned transmission systems which have so frequently decorated congressional hearing rooms are doing little to turn the wheels of new industry.

DEPA Administrator James F. Fairman recently stated that: "Present estimates indicate that by the end of 1952, total capacity requirements will be in the neighborhood of 85 million kilowatts. The generating capacity, if the whole

1952 program is achieved will be slightly less than 85 million kilowatts. Thus, failure for the third successive year to increase the margin between supply and demand means that during 1952 we can expect greater areas in which the power supply will be precarious." Mr. Fairman is a power company official.

Thus, assuming that every bit of new capacity scheduled for delivery in 1952 is installed, the electric capacity of the Nation will fall further behind. What is even worse, a national survey conducted by the electric power industry indicates that although some 10 million kilowatts of capacity is scheduled for delivery in 1952, from 2 to 4 million kilowatts of this capacity will not be available because of material shortages. Therefore, generation capacity may fall an additional 4 or 5 million kilowatts behind anticipated demand.

This is a dangerous situation, a situation which can mean nothing but greater curtailments in the industrial and agricultural expansion needed to meet emergency production goals.

No other major American industry is growing anything like as fast as the electric power industry. Demands are and have long been growing so fast that it must double the capacity of its entire plant facility every 10 years. The rate of increase now requires a 100-percent increase every 7½ years. The loads of the rural electric systems are growing even faster. They are doubling every 5 years.

Despite the fact that rural electric cooperatives have, to an increasing degree, been hard pressed to obtain sufficient wholesale energy during the last few years, power company spokesmen were stating as late as July of 1950 that the industry stood ready to meet all electric requirements in the country. One particular industry spokesman stated, "We are in an enviable position to meet power demands, not only for an enlarged defense program but to continue civilian production at a high rate."

Early in the Korean war, the same people predicted that the Government would use the war as excuse to impose controls on the industry and to increase Government production in the power business. Not until the war was well under way did the companies realize how badly they had underestimated the country's need for electricity. They then poured a torrent of frenzied orders for new equipment onto overloaded manufacturers. Predictions of large reserves were revised downward, but still the companies did not admit any serious shortage. As late as April 1951, they were still not fully awake to the fact that the situation was critical. A reserve of 8½ percent was predicted for this winter. A reserve of not less than 15 percent is considered safe. The peak load for 1951 will occur next week and I feel very strongly that the reserve capacity during this peak may well be less than half of what was predicted. Next week's figures of demand versus capability for the Nation will purport to indicate what reserve is available. Figures for demand will, however, indicate only connected loads. There is no way of knowing the real demand for electric power because no company ever connects more load than it can serve. It is therefore impossible for the measured demand to exceed the generation capability. However, the unavailability of large quantities of power for industrial expansion anywhere in the country is the real indication of what we are facing in the way of a power shortage. I am of the opinion that if the unconnected demand were considered in next week's determination of reserve capacity for 1951, the result would be an appreciable deficit rather than any reserve margin.

With this situation as the background, increasing numbers of the rural electric cooperatives are attempting to develop independent sources of wholesale energy. They are working at top efficiency to get construction under way on additional generation and transmission systems so that agricultural production will not be interrupted by power shortages. Many of these cooperative generation plants will operate as integrated parts of Federal hydroelectric facilities. The engineers say that integration with hydroelectric capacity is the best way to derive the maximum benefit from the steam plants, and we certainly need every available kilowatt just as fast as it can be developed.

The commercial utility companies are fighting these generation plants and integration plans to the utmost. They are fighting them in committees of the Congress; they are fighting them in the offices of the Rural Electrification Administration; they are fighting them before State regulatory bodies; they are fighting them in State legislatures; and they are fighting them in State and Federal courts. I have spent 2½ days of this week in the United States District Court for the District of Columbia listening to the legal arguments of 10 Missouri power companies that are trying to prevent the farmers of western Missouri from constructing a steam-generating plant to serve themselves. The companies say this is

competition and claim they have the absolute right to operate free from competition. How these attempts to restrict the electric capacity of the Nation can be justified in these times of emergency, we do not know. We think that there is no justification for it any more than we think there is justification for the industry's long fight against the development of Federal hydroelectric capacity and the transmission lines to deliver the hydro power at wholesale where it is needed. In short, we see the present acute power shortage as the inevitable result of the commercial power companies' perpetual underestimation of national power requirements and their long fight against expansion of the electric capacity of the Nation, and we see these same companies, unable to meet expanding loads themselves, still fighting to prevent others from rectifying the serious shortage they have brought about. The power companies have still apparently not learned what is wrong. They still talk about achieving adequate reserves of 16 percent by the end of 1954. It appears to us that we will have an ever-present power shortage until the Nation recognizes the need of encouraging not a 16-percent reserve by 1954 but an all-out unrestricted development of all the power resources of the Nation.

The limiting factor in our power development must be the power needs of the country rather than the economic capability of the companies. Certainly the companies are entitled to a fair return on their investment. Such a return is one prerequisite for maintaining and expanding modern efficient commercial utilities. We encourage such expansion because our systems purchase over 50 percent of their power from commercial utility companies. We paid them over $37,000,000 for power in fiscal 1950. We have never opposed the expansion plans of any utility anywhere. In turn, we only ask that where these private utilities find it uneconomical to serve thin areas, even at wholesale, as evidenced by excessive rates and inadequate service, they allow the rural electric cooperatives and federally financed hydroelectric facilities to fill the gap instead of jeopardizing the welfare of the country by attempting to maintain exclusive rights to generate and transmit electric power.

In general, the replies received by your committee from the State regulatory commissions give added emphasis to the need for adequate allocations. Some representative excerpts from these replies are given here.

Your committee acknowledges the gracious cooperation of regulatory commissions in the following States, Territory, and District which responded to your committee's invitation to submit comments and suggestions in connection with the electric power study undertaken by the committee:

Alabama	Louisiana	Pennsylvania
Arizona	Maryland	Rhode Island
Arkansas	Massachusetts	South Carolina
California	Michigan	South Dakota
Colorado	Mississippi	Tennessee
Connecticut	Missouri	Texas
Delaware	Montana	Utah
Florida	Nebraska	Washington
Georgia	New Jersey	West Virginia
Idaho	New Mexico	Wisconsin
Illinois	New York [1]	Hawaii
Indiana	Ohio	District of Columbia
Kansas	Oregon	

Suggestions Made by State Regulatory Commissions

Idaho Public Utilities Commission

Removal by Congress of this road block to needed developments in this area, with the Federal Government concentrating its own power program in areas where power shortages exist and where Federal expenditures for such a program are needed and can be justified, represent, as you have requested, our "con-

[1] Data were received from both the Public Service Commission of the State of New York and the Power Authority of the State of New York.

structive suggestions for maximum use of our existing power systems in the mobilization effort, and the best means to remedy power deficiencies, using to as great an extent as possible the existing enterprises in the field." * * * and respectfully suggest that where private systems have demonstrated their ability to serve area requirements they should be aided rather than hindered in carrying out their programs, which require no Government expenditure or subsidy, and also will provide a substantial tax base for added local and Federal revenues through property and income taxes.

Mississippi Power Co.

The Mississippi Public Service Commission having no statutory authority to regulate power, our suggestion toward preventing any deficiency in power supply in our company or the Southern Co. integrated system would be for the National Production Administration, through its agency DEPA, to assure proper priority assistance and allocation for delivery of steel, copper, aluminum, and other critical materials necessary to expedite the completion of power generating and transmission facilities as planned and required to meet the future power requirements as forecasted.

Indiana Public Service Commission

The basic trouble, of course, which your committee must know, as all industry knows, I am sure, is that the present priority system leaves much to be desired and unless some central agency is made responsible, all of the data furnished by us will be subject to the frequent changes dependent upon the inability of equipment manufacturers to meet their commitments. * * *

In summarizing, it would seem to us that Federal action, in straightening out the system of allocating materials or priorities system, would be a very important contribution to prevent or cure a possibly bad power situation.

Kansas State Corporation Commission

It is respectfully suggested that new plants in the process of construction or planned will meet the requirements of this State, including its role in the defense effort, without the necessity for Federal action other than to make materials available to provide for erection and equipping of said plants.

All these comments point up the need for seeing that adequate allocations of controlled materials are made and that, once made, they will be honored by the producers.

Several of the associations replying acknowledged the leadership of the Edison Electric Institute as an outstanding national association equipped to give assistance to your committee in its study of the electric power situation. In addition to having its representative confer with the staff of your committee, the institute has graciously consented to reproduction in full as part of this report the text of the tenth semiannual electric power survey report made by its Electric Power Survey Committee in cooperation with the power area representatives of the electric power systems and the manufacturers of heavy electric power equipment. The text of its report follows verbatim.

EDISON ELECTRIC INSTITUTE

TENTH SEMIANNUAL ELECTRIC POWER SURVEY, OCTOBER 1951

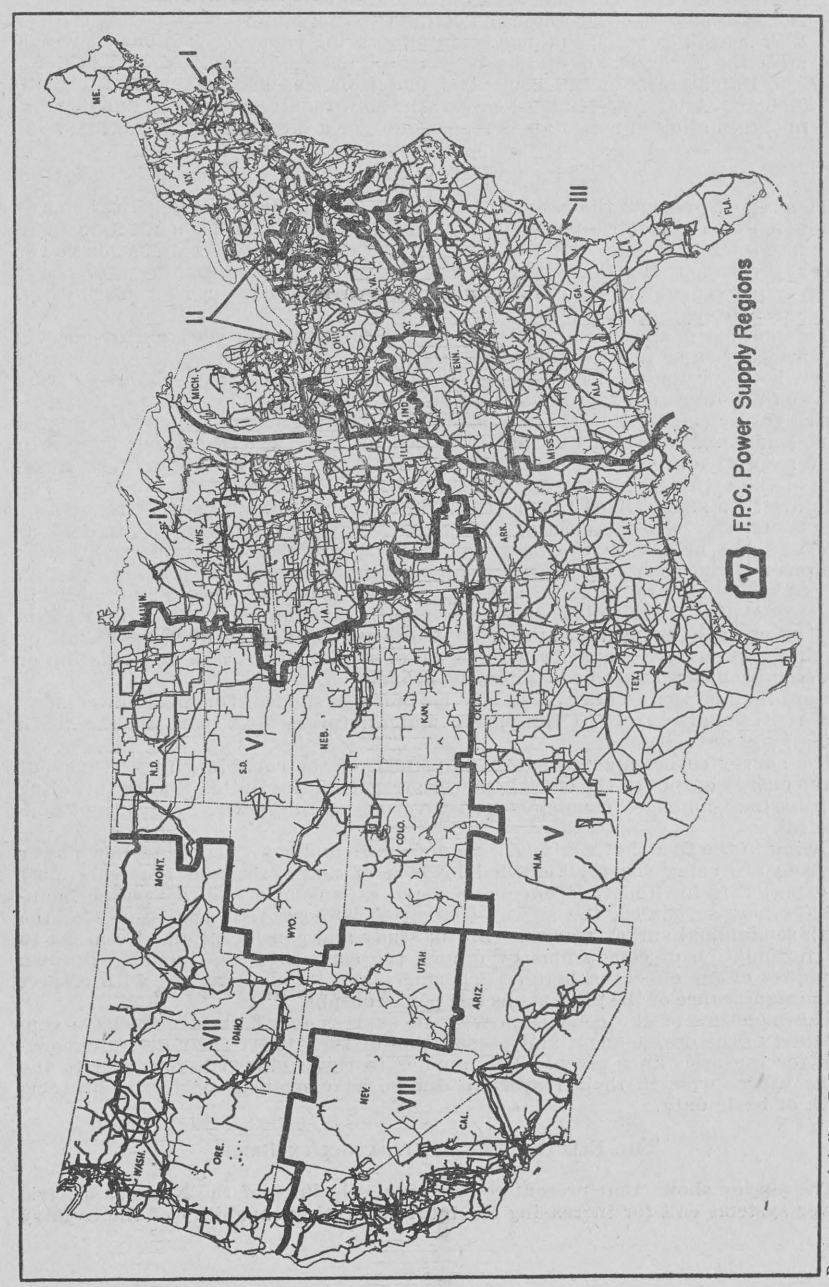
(A report of the electric power survey committee of the Edison Electric Institute in cooperation with the power area representatives of the electric power systems and the manufacturers of heavy electric power equipment)

SUMMARY OF BASIC FINDINGS OF SURVEY

1. Capability increases, as scheduled by the Nation's electric power systems, would raise the total capability for the country as a whole from 75,000,000 kilowatts at the end of 1951 to 104,000,000 kilowatts at the end of 1954. Lack of materials has sharply retarded construction and seriously threatens the scheduled expansion. Unless critical materials

in sufficient quantities are made available to the manufacturers and fabricators, possible losses of 4,000,000 kilowatts in scheduled capability by the end of 1952, and 8,000,000 kilowatts by the end of 1953 are predicted.

2. Peak loads for the country as a whole are estimated to be higher than forecast by the April 1951 survey. For 1952 the increase is about 2.5 percent and for both 1953 and 1954 the increase is about 3.5 percent.



Roman numerals indicate F. P. C. Power Supply Regions

Fig. 1—F. P. C. Power Supply Regions, Superimposed on Map of Principal Interconnected Electric Transmission Lines

93480—52——5

3. Gross margin for the total United States, on the basis of scheduled increases in capability, will be lower than forecast in the April 1951 survey because of higher loads. Indicated delays in equipment production and plant construction may reduce margins below minimum operating requirements and result in curtailments.

4. Manufacturing schedules previously reported for 1951 will not be met because material supplies have been inadequate. Schedules for 1952 are greatly in excess of those for 1951—they are at the limit of estimated production capacity under normal manufacturing conditions with full material supplies. On the basis of the existing materials situation, the 1952 schedules cannot be met. Manufacturing capacity is sufficient to meet the needs of all equipment—lack of materials is the road block.

5. Procurement of all controlled materials has become increasingly difficult. Allotments, in most cases, are below requirements, but inability to obtain allotted materials is responsible for a large part of the delays.

Introduction

This report presents the results of the tenth semiannual electric power survey conducted by the electric power survey committee of the Edison Electric Institute in cooperation with representatives of the electric power systems, or power areas, throughout the United States and the principal manufacturers of heavy electric power equipment. The survey was carried out in New York City, October 2 through 6, 1951.

The purpose of these semiannual surveys is to determine the existing electric power situation as well as the expected situation for the immediately following years, both for the country as a whole and on a regional basis. During each survey the power area representatives present data concerning existing and estimated future capabilities, planned expansions of generating capacity, estimated peak loads, and other factors having a bearing upon electric power supply in their respective areas. These data are reviewed and coordinated in joint meetings of the area representatives and the electric power survey committee. The data are then summarized for presentation in the semiannual survey reports.

Concurrently with the meetings of the power area representatives, individual meetings are held with the principal manufacturers of heavy electric power equipment, who report and discuss shipments made since the previous survey, orders on hand, production schedules, and estimates of open manufacturing capacity available for the production of additional equipment. The discussions also cover such items as material supplies, availability of manpower, full or maximum productive capacity, time cycle of manufacture, and any existing or foreseen problems related to equipment production.

More than 60 representatives of electric power systems throughout the country and representatives of 19 equipment manufacturers took part in the tenth semiannual survey.

The survey covers approximately 95 percent of the capability and 98 percent of the energy output of the electric power systems in the United States, including both business-managed companies and governmental agencies, Federal and non-Federal.

Owing to the fact that equipment manufacture and construction of new power projects are being sharply retarded by lack of materials, and that this must be expected to have marked effects upon the expansion of electric power facilities, as now scheduled, the survey committee believes that the results of the tenth semiannual survey warrant careful study and consideration. To assist in the formulation of conclusions by others, the committee has included its own estimates of the effects of material shortages and its observations with respect to the significance of the present electric power output.

The members of the committee wish to express to all those who have contributed to the development and preparation of this report their deep appreciation for the assistance given. This applies to those named herein and to the many others who, in their respective duties, have made possible the bringing forth of basic data.

The Electric Power Situation in Brief

The survey shows that present construction schedules of the Nation's electric power systems call for increasing the total generating capability of the country

as a whole from approximately 75,000,000 kilowatts at the end of 1951 to 104,000,000 kilowatts by the end of 1954. These schedules are based upon equipment delivery dates as originally established by the manufacturers and upon the expectation that materials for plant construction will be obtainable as needed to meet the construction requirements.

The status of production of heavy electric power equipment, as of October 1, 1951, shows that lack of materials has already caused substantial and irrecoverable losses in manufacturing time which will almost certainly result in prolonged delays in the scheduled operating dates of many new power projects. This is particularly true in the case of steam generators where delivery dates on a large number of units have been extended. Further delays are almost certain to occur.

TENTH SEMI-ANNUAL ELECTRIC POWER SURVEY

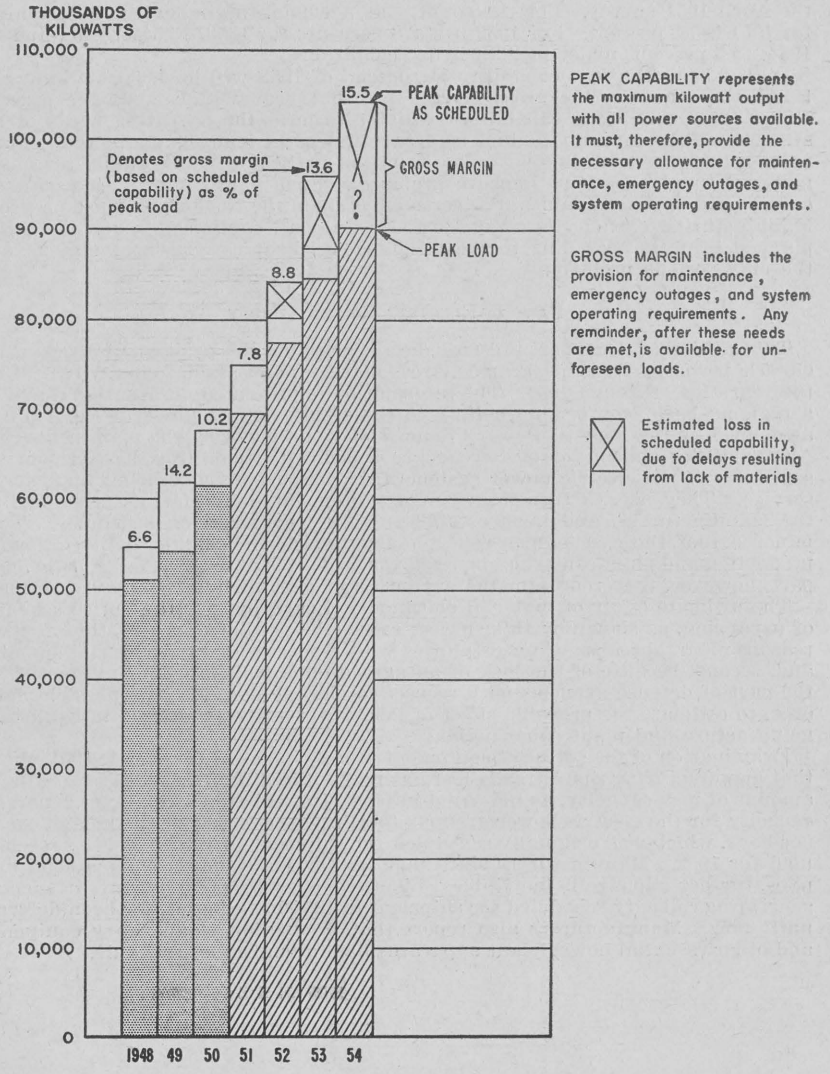


Fig. 2—Total U. S. A. Peak Capabilities and Peak Loads, 1948 Through 1954—Median Hydro Conditions

Production of auxiliary equipment and other essential power plant apparatus has also fallen behind schedule because of lack of materials. Lack of structural steel and plate for plant erection is seriously retarding construction progress.

It is estimated that because of these delays at least 4,000,000 kilowatts of the new capacity now scheduled for operation by the end of 1952 will not be available. It is further estimated that if the present material supply situation is not promptly improved, up to 8,000,000 kilowatts of new generating capacity now scheduled to be in service by the end of 1953 will not be available.

The survey indicates that, for the country as a whole, peak loads for the next 3 years will be higher than those forecast at the time of the April 1951 survey. The increase for 1952 is about 2.5 percent, and for both 1953 and 1954 the increase is about 3.5 percent. These estimates are based upon the expectation that new defense loads will come in according to schedule. There is little change in the estimated peak load for 1951.

On the basis of scheduled increases in capability and estimated peak loads, as shown by the survey, gross margins (which must provide for maintenance, emergency outages, and system operating requirements) will be lower than shown by the April 1951 survey. For the country as a whole, the indicated gross margin for 1951 is 7.8 percent. For 1952 it is 8.8 percent; for 1953, 13.6 percent; and for 1954, 15.5 percent, under median hydro conditions.

On the basis that the capability at the end of 1952 will be 4,000,000 kilowatts below the schedule, the gross margin for that year will be only 3.7 percent. Under these conditions capability available to meet the operating needs of the systems will be inadequate, and load curtailment in many parts of the country will probably be unavoidable. The situation in 1953 will be equally serious if material supply does not improve promptly. Such power shortages would unquestionably have a significant adverse effect upon the Nation's defense program. Manufacturing capacity is adequate to produce all equipment required for the planned projects according to the established schedules. Lack of materials is the only serious problem.

Part I. Electric Power Supply

This section of the report presents data concerning the peak capabilities of the electric power systems, peak loads, gross margins, and annual energy output for the years 1948 through 1954. The information is presented on a national and on a regional basis, conforming mainly to the eight power regions of the country, as defined by the Federal Power Commission and shown by the map in figure 1.

Capabilities shown for each year are scheduled capabilities based upon the schedules of the electric power systems for placing new generating facilities in service. They are, in turn, based upon equipment deliveries, as scheduled by the manufacturers, and upon established plant construction schedules. To a minor extent these schedules reflect delays already encountered in equipment production and plant construction, resulting from lack of materials. For the most part, however, they represent the expansion of capability as originally planned.

The ultimate effect of material shortages on carrying out the entire schedule of expansion, as shown by this survey, cannot be predicted at this time for two reasons: First, because of uncertainties with respect to future material supplies, and, second, because of the lack of an agreed-upon policy, up to the present, on the part of defense agencies with respect to electric power. It is possible, however, to estimate the probable effect of delays already encountered in equipment manufacture and plant construction.

Examination of the status of equipment production as of October 1, 1951, shows that manufacturing time already lost has necessitated the rescheduling of a large amount of new capacity, as indicated in part II of this report. Steam generator capacity for the electric power systems totaling over 18,000,000 pounds of steam per hour, which was originally scheduled for shipment in 1951, has been rescheduled for 1952. Manufacturers state that, on the basis of present material supplies, further slippage is inevitable. Likewise, over 450,000 kilowatts of electric generating capacity scheduled for shipment in 1951 has of necessity been deferred until 1952. Manufacturers also report that production of auxiliary equipment and other essential power plant apparatus has fallen behind schedule.

A recent committee survey of progress in construction of a large number of new power projects revealed that less than half the structural steel required during the last three quarters of 1951 had been obtained.

Evaluation of the combined effects of these known delays indicates that at least 4,000,000 kilowatts of new capacity now scheduled for service by the end of 1952 will not be available. Manufacturing schedules for 1952 are already filled to the limit of productive capacity, so that accumulated losses would not be recoverable during that year, even if all required materials were made available. The estimated deficit in 1952 capability, therefore, must be expected to carry over into later years.

There is no assurance at present that manufacturers will be able to obtain sufficient materials to carry out the production now scheduled for 1952. Shipments of electric generating capacity—both thermal and hydraulic—to the electric power systems in 1951 are expected to total about 6,100,000 kilowatts. Scheduled shipments for 1952 amount to 10,400,000 kilowatts. For 1953 the total is more than 11,000,000 kilowatts.

Shipments of steam generator capacity in 1951 are expected to amount to only about 43,000,000 out of 62,000,000 pounds of steam per hour scheduled as of last April. Shipments now scheduled for 1952 total over 111,000,000 pounds of steam per hour.

With material supplies as limited as they have been for the past several months it is evident that these much larger schedules for 1952 could not be accomplished. It is estimated that unless there is a very substantial increase in materials for the electric power program, at least 8,000,000 kilowatts of new capacity now scheduled for service by the end of 1953 will not be available.

DEFINITIONS

Capability as used herein refers to maximum kilowatt output with all generating sources available, account being taken of the power requirements of auxiliary equipment only. Thus, this capability must provide for scheduled maintenance, emergency outages, and system operating requirements in addition to the estimated load and any unforeseen load.

The capability of a system is defined as the maximum kilowatt output with all power sources available, with no allowances for outages and with sufficient kilowatt-hour output available to take care of all the energy requirements of the system load. The capability of existing installations is determined on the basis of operating experience. For new and projected installations it is determined on the basis of design data and expected operating performance.

The capability of a hydro-power source is determined by the dependable capacity at the time of the peak load and the energy available for carrying the system load. Therefore, capabilities for those systems served wholly or in part by hydro-power sources have been determined for both median and adverse hydro conditions for the years 1951 through 1954. For the country as a whole, adverse hydro conditions have no special significance, because experience has shown that severe drought at any one time is confined to limited sections of the country. However, adverse hydro conditions may have an exceedingly severe effect on certain limited areas.

Capabilities as reported herein for each power region is the sum of the peak capabilities serving the region. The capabilities of all systems normally interconnected are based upon fully coordinated operation.

Estimated peak loads for each power region are the summation of the estimated December peak loads on the systems serving the region, account being taken of any diversity between peak loads on systems that are operated as a closely coordinated group.

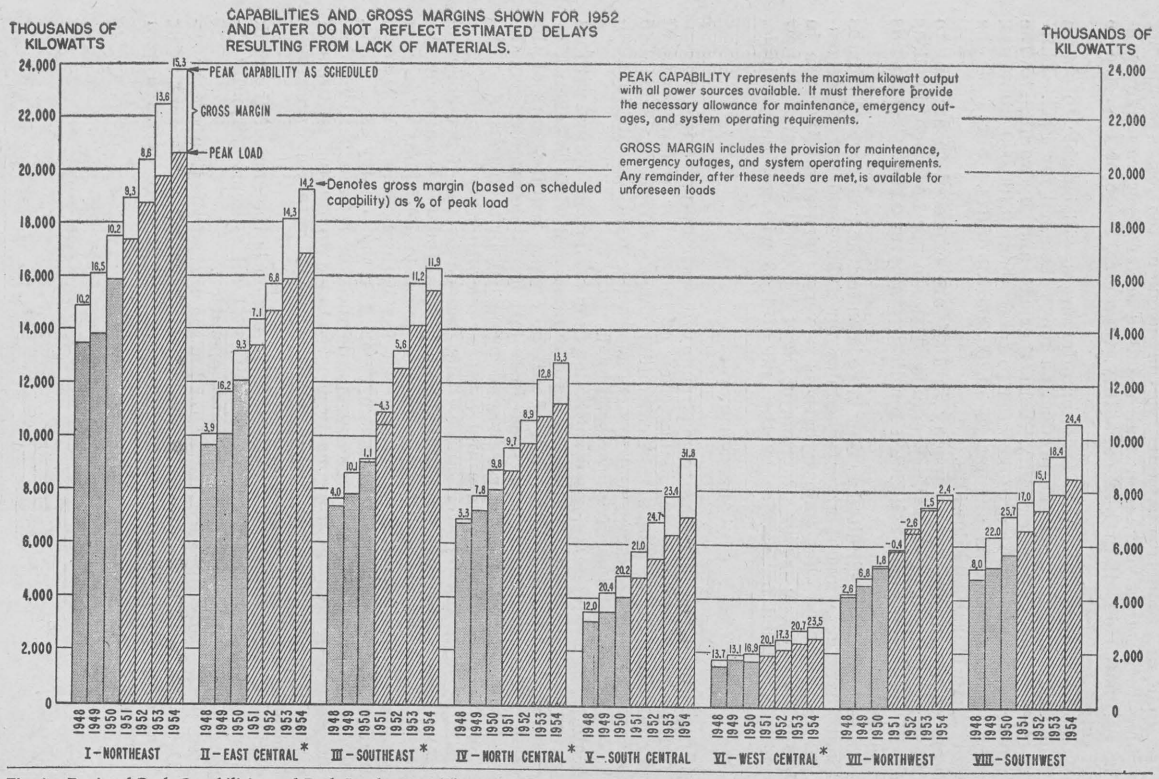


Fig. 3—Regional Peak Capabilities and Peak Loads, 1948 Through 1954—Median Hydro Conditions

Figures for 1948, 1949, and 1950 represent actual operating data.

*1948 and 1949 data for these regions are not directly comparable with the regional data for 1950 and beyond due to changes in regional classification of certain electric power systems, effective with the Ninth Semi-Annual Survey.

MEDIAN HYDRO CONDITIONS

TABLE 1-A—*Peak capabilities, peak loads and gross margins*[1] *by regions, 1948 through 1964*

[In thousands of kilowatts]

[Capabilities and gross margins shown for 1952 and beyond do not reflect delays resulting from lack of materials]

Regions[2]	1948[3]	1949[3]	Percent increase[4]	1950[3]	1951	Percent increase[4]	1952	Percent increase[4]	1953	Percent increase[4]	1954	Percent increase[4]
Region I:												
Capability scheduled	14,964	16,112	7.7	17,519	18,985	8.4	20,347	7.2	22,458	10.4	23,791	5.9
Peak load	13,577	13,828	1.8	15,900	17,371	9.3	18,733	7.8	19,763	5.5	20,626	4.4
Gross margin	1,387	2,284		1,619	1,614		1,614		2,695		3,165	
Gross margin percent	10.2	16.5		10.2	9.3		8.6		13.6		15.3	
Region II:[5]												
Capability scheduled	10,025	11,654	16.2	13,208	14,337	8.5	15,695	9.5	18,180	15.8	19,281	6.1
Peak load	9,653	10,027	3.9	12,079	13,381	10.8	14,696	9.8	15,901	8.2	16,878	6.1
Gross margin	372	1,627		1,129	956		999		2,279		2,403	
Gross margin percent	3.9	16.2		9.3	7.1		6.8		14.3		14.2	
Region III:[5]												
Capability scheduled	7,701	8,662	12.5	9,179	10,447	13.8	13,253	26.8	15,765	19.0	17,345	10.0
Peak load	7,403	7,869	6.3	9,076	10,915	20.3	12,553	15.0	14,174	12.9	15,501	9.4
Gross margin	298	793		103	(468)		700		1,591		1,844	
Gross margin percent	4.0	10.1		1.1	(4.3)		5.6		11.2		11.9	
Region IV:[5]												
Capability scheduled	6,975	7,796	11.8	8,794	9,618	9.4	10,648	10.7	12,130	13.9	12,815	5.6
Peak load	6,751	7,232	7.1	8,012	8,769	9.4	9,776	11.5	10,753	10.0	11,313	5.2
Gross margin	224	564		782	849		872		1,377		1,502	
Gross margin percent	3.3	7.8		9.8	9.7		8.9		12.8		13.3	
Region V:[6]												
Capability scheduled	3,538	4,232	19.6	4,844	5,761	18.9	6,826	18.5	7,832	14.7	9,258	18.2
Peak load	3,160	3,516	11.3	4,030	4,762	18.2	5,474	15.0	6,345	15.9	7,025	9.5
Gross margin	378	716		814	999		1,352		1,487		2,233	
Gross margin percent	12.0	20.4		20.2	21.0		24.7		23.4		31.8	
Region VI:[5]												
Capability scheduled	1,759	1,987	13.0	1,942	2,298	18.3	2,476	7.7	2,801	13.1	3,094	10.5
Peak load	1,547	1,757	13.6	1,661	1,913	15.2	2,111	10.4	2,321	9.9	2,506	8.0
Gross margin	212	230		281	385		365		480		588	
Gross margin percent	13.7	13.1		16.9	20.1		17.3		20.7		23.5	
Region VII:												
Capability scheduled	4,245	4,858	14.4	5,290	5,825	10.1	6,478	11.2	7,461	15.2	7,963	6.7
Peak load	4,139	4,550	9.9	5,199	5,847	12.5	6,649	13.7	7,354	10.6	7,777	5.8
Gross margin	106	308		91	(22)		(171)		107		186	
Gross margin, percent	2.6	6.8		1.8	(0.4)		(2.6)		1.5		2.4	
Eastern division:												
Capability scheduled	799	903	13.0	994	1,116	12.3	1,287	15.3	1,421	10.4	1,494	5.1
Peak load	757	833	10.0	921	1,054	14.4	1,176	11.6	1,235	5.0	1,343	8.7
Gross margin	42	70		73	62		111		186		151	
Gross margin, percent	5.5	8.4		7.9	5.9		9.4		15.1		11.2	
Western division:												
Capability scheduled	3,446	3,955	14.8	4,296	4,709	9.6	5,191	10.2	6,040	16.4	6,469	7.1
Peak load	3,382	3,717	9.9	4,278	4,793	12.0	5,473	14.2	6,119	11.8	6,434	5.1
Gross margin	64	238		18	(84)		(282)		(79)		35	
Gross margin, percent	1.9	6.4		0.4	(1.8)		(5.2)		(1.3)		0.5	
Region VIII:												
Capability scheduled	5,229	6,410	22.6	7,112	7,654	7.6	8,456	10.5	9,381	10.9	10,554	12.5
Peak load	4,840	5,255	8.6	5,660	6,540	15.5	7,348	12.4	7,921	7.8	8,481	7.1
Gross margin	389	1,155		1,452	1,114		1,108		1,460		2,073	
Gross margin, percent	8.0	22.0		25.7	17.0		15.1		18.4		24.4	

See footnotes at end of table.

TABLE 1-A—*Peak capabilities, peak loads and gross margins* [1] *by regions, 1948 through 1964*—Continued

[In thousands of kilowatts]

Capabilities and gross margins shown for 1952 and beyond do not reflect delays resulting from lack of materials]

Regions [2]	1948 [3]	1949 [3]	Percent increase [4]	1950 [3]	1951	Percent increase [4]	1952	Percent increase [4]	1953	Percent increase [4]	1954	Percent increase [4]
Total United States:												
Capability scheduled	54,436	61,711	13.4	67,888	74,925	10.4	84,179	12.4	96.008	14.1	104,101	8.4
Peak load	51,070	54,034	5.8	61,617	69,498	12.8	77,340	11.3	84,532	9.3	90,107	6.6
Gross margin	3,366	7,677	------	6,271	5,427	------	6,839	------	11,476	------	13,994	------
Gross margin, percent	6.6	14.2	------	10.2	7.8	------	8.8	------	13.6	------	15.5	------

[1] Gross margins represent capability available to cover maintenance, emergency outages, and system operating requirements; any remainder after these needs are met is available for unforeseen loads. FPC data for December 1950 for the country as a whole show that "reported required reserves" were 7.3 percent of dependable capacity. On the basis of this percentage the required reserves would be about 5½ million kilowatts for 1951; 6 million kilowatts for 1952; 7 million kilowatts for 1953; and 7½ million kilowatts for 1954.

[2] Approximately as defined by Federal Power Commission.

[3] Figures for 1948, 1949, and 1950 represent actual operating data.

[4] Percentage of increase over preceding year.

[5] 1948 and 1949 data for these regions are not directly comparable with the regional data for 1950 and beyond due to changes in regional classification of certain electric power systems effective with the ninth semiannual survey.

[6] For region V, peak loads shown are for December. In summer months peak loads are substantially higher and margins lower.

ADVERSE HYDRO CONDITIONS

TABLE 1-B—*Peak capabilities, peak loads, and gross margins* [1] *by regions, 1951 through 1954*

[In thousands of kilowatts]

[Capabilities and gross margins shown for 1952 and beyond do not reflect delays resulting from lack of materials]

Regions [2]	1951	1952	Percent increase [3]	1953	Percent increase [3]	1954	Percent increase [3]
Region I:							
Capability scheduled	18,661	20,098	7.7	22,215	10.5	23,560	6.1
Peak load	17,375	18,737	7.8	19,767	5.5	20,630	4.4
Gross margin	1,286	1,361	--------	2,448	--------	2,930	--------
Gross margin, percent	7.4	7.3	--------	12.4	--------	14.2	--------
Region II:							
Capability scheduled	14,288	15,646	9.5	18,131	15.9	19,232	6.1
Peak load	13,381	14,696	9.8	15,901	8.2	16,878	6.1
Gross margin	907	950	--------	2,230	--------	2,354	--------
Gross margin, percent	6.8	6.5	--------	14.0	--------	13.9	--------
Region III:							
Capability scheduled	9,943	12,724	28.0	15,178	19.3	16,733	10.2
Peak load	10,915	12,553	15.0	14,174	12.9	15,501	9.4
Gross margin	(972)	171	--------	1,004	--------	1,232	--------
Gross margin, percent	(8.9)	1.4	--------	7.1	--------	7.9	--------
Region IV:							
Capability scheduled	9,537	10,565	10.8	12,041	14.0	12,726	5.7
Peak load	8,769	9,776	11.5	10,753	10.0	11,313	5.2
Gross margin	768	789	--------	1,288	--------	1,413	--------
Gross margin, percent	8.8	8.1	--------	12.0	--------	12.5	--------
Region V: [4]							
Capability scheduled	5,718	6,783	18.6	7,789	14.8	9,215	18.3
Peak load	4,762	5,474	15.0	6,345	15.9	7,025	10.7
Gross margin	956	1,309	--------	1,444	--------	2,190	--------
Gross margin, percent	20.1	23.9	--------	22.8	--------	31.2	--------

See footnotes at end of table.

TABLE 1-B—*Peak capabilities, peak loads, and gross margins*[1] *by regions, 1951 through 1954*—Continued

[In thousands of kilowatts]

[Capabilities and gross margins shown for 1952 and beyond do not reflect delays resulting from lack of materials]

Regions[2]	1951	1952	Percent increase[3]	1953	Percent increase[3]	1954	Percent increase[3]
Region VI:							
Capability scheduled	2,331	2,518	8.0	2,848	13.1	3,145	10.4
Peak load	1,946	2,153	10.6	2,368	10.0	2,557	8.0
Gross margin	385	365		480		588	
Gross margin—percent	19.8	17.0		20.3		23.0	
Region VII:							
Capability scheduled	5,131	5,675	10.6	6,443	13.5	7,329	13.8
Peak load	5,847	6,649	13.7	7,354	10.6	7,777	5.8
Gross margin	(716)	(974)		(911)		(448)	
Gross margin—percent	(12.2)	(14.6)		(12.4)		(5.8)	
Eastern division:							
Capability scheduled	1,116	1,285	15.1	1,419	10.4	1,492	5.1
Peak load	1,054	1,176	11.6	1,235	5.0	1,343	8.7
Gross margin	62	109		184		149	
Gross margin—percent	5.9	9.3		14.9		11.1	
Western division:							
Capability scheduled	4,015	4,390	9.3	5,024	14.4	5,837	16.2
Peak load	4,793	5,473	14.2	6,119	11.8	6,434	5.1
Gross margin	(778)	(1,083)		(1,095)		(597)	
Gross margin—percent	(16.2)	(19.8)		(17.9)		(9.3)	
Region VIII:							
Capability scheduled	7,654	8,053	5.2	8,931	10.9	10,104	13.1
Peak load	6,540	7,344	12.3	7,918	7.8	8,480	7.1
Gross margin	1,114	709		1,013		1,624	
Gross margin—percent	17.0	9.7		12.8		19.2	
Total, United States:							
Capability scheduled	73,263	82,062	12.0	93,576	14.0	102,044	9.0
Peak load	69,535	77,382	11.3	84,580	9.3	90,161	6.6
Gross margin	3,728	4,680		8,996		11,883	
Gross margin—percent	5.4	6.0		10.6		13.2	

[1] Gross margins represent capability available to cover maintenance, emergency outages, and system operating requirements; any remainder after these needs are met is available for unforeseen loads.
[2] Approximately as defined by Federal Power Commission.
[3] Percentage of increase over preceding year.
[4] For region V, peak loads shown are for December. In summer months peak loads are substantially higher and margins lower.

Gross margin (or capability margin) represents the difference between capability, as defined above, and peak load. Gross margin, therefore, should be of sufficient magnitude to provide for scheduled maintenance, emergency outages, and system operating requirements, if practical operating conditions are to be maintained. Any excess in the gross margin over and above the provision for these items is available for unforeseen loads.

Gross margins, as reported herein for each power region, represent the difference between December peak capability and December peak load for the region. The term "gross margin percent" is used to express the gross margin at the time of the peak load as a percentage of the peak load.

Insofar as possible, scheduled maintenance outages are ordinarily programed for the off-peak seasons, so that at the time of the peak load the outages of equipment for maintenance may be kept to a minimum. For some systems, depending upon seasonal characteristics of the load, the gross margin during the off-peak season may be even lower than during the peak period. Emergency outages are unpredictable, and require that the system be prepared at all times to contend with such outages without disrupting operations. A margin of capability is required for system operation at all times to take care of the frequency and voltage regulation and control of generating stations and tie-line loading and other internal system conditions.

RESULTS OF THE SURVEY

Peak capabilities on the basis of scheduled additions to generating capacity, peak loads, and gross margins of the electric power systems at the time of the peak loads are shown for the country as a whole in figure 2, and on a regional basis in figure 3. Data for the years preceding 1951 represent actual operating conditions experienced. Estimates for 1951 through 1954 are based upon median hydro conditions.

Detailed data corresponding to figures 2 and 3 are given in table I–A. Table I–B gives similar data for the years 1951 through 1954, based on adverse hydro conditions.

TABLE II-A.—*Electric energy output, 1948 through 1954*

[In millions of kilowatt-hours]

[Data for 1952 and beyond are based upon scheduled increases in capability]

Regions [1]	1948 [2]	1949 [2]	Percent increase [3]	1950 [2]	1951	Percent increase [3]	1952	Percent increase [3]	1953	Percent increase [3]	1954	Percent increase [3]
I. Northeast	70,176	70,676	0.7	79,441	88,908	11.9	97,172	9.3	102,506	5.5	107,093	4.5
II. East Central [4]	54,726	54,163	(1.0)	65,584	73,611	12.2	82,021	11.4	91,221	11.2	95,628	4.8
III. Southeast [4]	39,766	42,911	7.9	48,825	56,525	15.8	66,534	17.7	77,409	16.3	85,475	10.4
IV. North Central [4]	35,030	36,112	3.1	40,115	44,458	10.8	49,312	10.9	55,745	13.0	59,167	6.1
V. South Central	18,058	20,162	11.7	23,018	28,325	23.1	32,937	16.3	38,676	17.4	43,863	13.4
VI. West Central [4]	7,986	8,579	7.4	7,976	9,528	19.5	10,668	12.0	11,676	9.4	12,675	8.6
VII. Northwest	24,173	25,935	7.3	29,959	34,050	13.7	38,898	14.2	43,975	13.1	46,168	5.0
Eastern division	4,394	4,848	10.3	5,376	5,945	10.6	6,557	10.3	7,207	9.9	7,634	5.9
Western division	19,779	21,087	6.6	24,563	28,108	14.4	32,341	15.1	36,768	13.7	38,534	4.8
VIII. Southwest	27,113	29,119	7.4	31,493	35,272	12.0	39,921	13.2	43,359	8.6	46,385	7.0
Total, United States	277,028	287,657	3.8	326,391	370,680	13.6	417,463	12.6	464,567	11.3	496,454	6.9

[1] Approximately as defined by Federal Power Commission.
[2] Figures for 1948, 1949, and 1950 represent actual operating data.
[3] Percentage of increase over preceding year.
[4] 1948 and 1949 data for these regions are not directly comparable with the data for 1950 and beyond due to changes in regional classification of certain electric power systems, effective with the ninth semiannual survey.

TABLE II-B.—*Annual load factor, 1948 through 1954*

[Percent]

Regions [1]	1948 [2]	1949 [2]	1950 [2]	1951	1952	1953	1954
I. Northeast	59.0	58.3	57.0	58.4	59.2	59.2	59.3
II. East Central [3]	64.7	61.7	65.2	66.2	67.1	68.9	68.0
III. Southeast [3]	61.3	62.3	59.5	57.3	58.7	60.6	61.2
IV. North Central [3]	59.2	57.0	57.2	57.8	57.6	59.3	59.7
V. South Central	65.2	65.5	65.2	67.9	68.7	69.6	71.3
VI. West Central [3]	58.9	55.7	54.7	56.7	57.5	57.3	57.6
VII. Northwest	66.7	65.1	65.7	66.5	66.8	68.3	67.8
Eastern division	66.3	66.4	66.6	64.4	63.6	66.6	64.9
Western division	66.8	64.8	65.5	66.9	67.5	68.6	68.4
VIII. Southwest	63.8	63.3	63.5	61.6	62.0	62.5	62.4
Total, United States	61.9	60.8	60.5	60.9	61.6	62.7	62.9

[1] Approximately as defined by Federal Power Commission.
[2] Figures for 1948, 1949, and 1950 represent actual operating data.
[3] 1948 and 1949 data for these regions are not directly comparable with the data for 1950 and beyond due to changes in regional classification of certain electric power systems, effective with the ninth semiannual survey.

NATIONAL GROSS MARGINS

The survey shows an expected gross margin for the total United States of 7.8 percent in December 1951. On the basis of scheduled capabilities, the indicated gross margin for 1952 is 8.8 percent; for 1953, 13.6 percent; and for 1954, 15.5 percent—all on the basis of median hydro conditions. It should always be kept in mind that the gross margin represents the difference between maximum capability of generating sources, with no allowance for outage, and estimated peak load on the systems. It does not represent what might be construed as excess capacity wholly available to carry additional load. It must provide for scheduled maintenance outages, emergency outages, and system operating requirements. The remainder of this margin, after these needs are met, is available for additional or unforeseen loads.

With these operating factors in mind the seriousness of the estimated loss of 4,000,000 kilowatts of scheduled capability by the end of 1952 can be more fully understood. Under these conditions the gross margin for 1952 would be only about 3.7 percent. This is believed to be below the average minimum operating requirements, exclusive of the needs for maintenance outages. It would mean also that even if scheduled maintenance were deferred, there would be situations in which sizable blocks of load would probably have to be cut off during periods of peak demands, and loads that could be carried would be subject to interruption without warning in the event of failure of any generating source.

The accumulation of a loss of 8,000,000 kilowatts of scheduled capability by the end of 1953 would in all probability cause the situation to become progressively worse. Maintenance cannot be deferred indefinitely, and outages for this purpose would soon lower the ability to carry load even during the off-peak periods. The situation thus developed could be expected to take years to overcome, as has been the case in some European countries during and since World War II.

A further consideration is that, under such conditions, older equipment, now satisfactorily used to meet daily peak loads, would be forced into long-time, heavy-duty base-load service for which it is no longer suited because of the frequent and excessive amount of maintenance it would require. Thus, further operating problems would arise and the matter of scheduled maintenance would be further complicated.

REGIONAL MARGINS

In practically all regions, the indicated gross margin on the basis of scheduled capability is lowest in 1952. In region III the estimated peak load for 1951 exceeds the total peak capability, but in 1952 the indicated gross margin becomes 5.6 percent and increases to over 11 percent for 1953 and to almost 12 percent in 1954.

In the western division of region VII estimated peak loads from 1951 through 1953 exceed the scheduled capability. In 1954 the scheduled capability becomes just about equal to the estimated peak load under median hydro conditions. In all other regions, excepting region III, the gross margin in 1953 would be over 12 percent if the scheduled expansion of capability were carried out.

It should be understood that peak loads shown for region V are for December, to be consistent with other regions. Actually, during the summer months in region V, peak loads are substantially higher and margins lower than in December.

ANNUAL ENERGY OUTPUT

Table II, A and B, shows the annual energy output and the load factor by regions and for the country as a whole. The figures for 1948, 1949, and 1950 are based on actual operating results and those for the years 1951 through 1954 are based upon the estimates of the electric power systems.

COMMITTEE OBSERVATIONS

The survey committee views the present outlook of the electric power situation with grave concern. It believes that the increase in generating capability, as scheduled, would in most instances meet the foreseeable needs and possible eventualities of the next 3 years with reasonable safety and assurance. Failure to meet these objectives, however, can seriously weaken the country's position at the very time when increased industrial strength and economic superiority

become most vital. High industrial production must be backed by an adequate and unfailing supply of electric power. Construction of necessary new equipment and new power projects are long-term undertakings. They cannot wait until the needs for the additional power are upon us. They must precede and not follow. The electric power systems have planned on that basis.

The importance and essentiality of a substantial increase in capability of the electric power systems to adequately meet the requirements for defense production and for sustaining the desired national economy apparently have not been fully appreciated by all of the defense agencies. The initiative taken by the Defense Production Administration in forming a committee of experienced personnel to review load estimates and requirements in the various areas of the country is encouraging. It is hoped that as a result of the work of this group and the data obtained, together with other pertinent data, the relative urgency of the new power projects will become more evident, so that preference can be given to those needed most. In this manner the effects of material shortages on the electric power situation will at least be minimized. Otherwise there may be a condition where many unfinished projects will exist throughout the country.

Part II. Status of Production of Heavy Electric Power Equipment

This section of the report presents a summary of information relative to shipments, scheduled production, and estimated open-manufacturing capacity of 19 of the country's leading manufacturers of heavy electric power equipment as of October 1, 1951. These manufacturers represent the Nation's main sources of equipment of the types and sizes covered by the survey.

The data given herein pertain to:

Large steam turbine generators, 10,000 kilowatts and larger.
Small steam turbine generators, 4,000 to 9,999 kilowatts.
Water-wheel generators, 4,000 kilowatts and larger.
Steam generators, 450-p. s. i. pressure and higher.
Hydraulic turbines, 5,000 horsepower and larger.
Power transformers, 501 kilovolt-amperes and larger.

In meetings held with the individual manufacturers during the survey, the materials situation and its effects on production were discussed in detail. The manufacturers presented data concerning their material allotments in relation to actual requirements, and reviewed their experience in attempts to obtain the materials allotted to them.

The effects of lack of materials on scheduled production are reflected only in part in the schedules presented herein. Uncertainties with respect to material supplies make it impossible for manufacturers to predict more than a short time ahead what changes may have to be made in their schedules. The situation is aggravated by the fact that various materials at different times become more difficult to obtain than others, with the result that production is thrown out of balance first one way and then another. Under these circumstances it is not possible to determine the extent to which production of individual units may be affected.

The manufacturers are making every effort to keep delays to a minimum and are continuously hopeful that the material supply situation will improve. Thus, scheduled shipping dates for individual units are continued in the schedules until extensions become inevitable. The manufacturers recognize, however, that with the material supply situation as it is, the over-all production will fall further and further behind, with the result that existing schedules will be considerably lengthened. This should be kept clearly in mind in reviewing the schedules presented herein.

The estimates of open-manufacturing capacity shown for the various classes of equipment are based upon the productive capacity of existing manufacturing facilities, assuming that production of equipment now on order would proceed according to schedule and that materials required for the additional equipment would be readily obtainable. The figures, therefore, represent the potential capacity of manufacturing facilities rather than the amount of additional capacity that could be produced under existing conditions.

Table III shows, as of October 1, 1951, the total capacity of each class of equipment covered by the survey, shipped and scheduled for shipment during the period starting with 1948. This tabulation also shows the percentage distribution of the capacity among the different groups of purchasers. Tables XI through XVII at the end of this report give additional details.

Table IV shows the total capacity of electric generating equipment shipped since the beginning of 1951 and on order scheduled for shipment as of October 1, 1951, and includes corresponding data as of April 1, 1951. The table also shows new capacity scheduled between April 1 and October 1 and the capacity shipped during the same period. At the bottom of the table the changes in scheduled shipments between April 1 and October 1, 1951, are shown.

The data show that new capacity scheduled during the 6-month period exceeds the capacity shipped during the same period. Also, as of October 1, the scheduled shipments for 1951 to United States electric power systems are 458,100 kilowatts less than shown in April. Scheduled shipments for 1952 have increased by only 54,400 kilowatts. This increase is less than the amount transferred from 1951 because of the rescheduling of certain units from 1952 to 1953. The increases in scheduled production for 1953 and beyond chiefly result from new orders placed since April 1.

The following pages show similar data for the individual class of equipment covered by the survey.

TABLE III.—*Shipments and scheduled shipments for the period 1948 and later years, as of Oct. 1, 1951*

	Total capacity	Distribution according to purchaser groups		
		United States electric power systems	United States industrials	Outside United States
		Percent	*Percent*	*Percent*
Large steam turbine generators.....kilowatts..	45,153,700	90.7	5.0	4.3
Small steam turbine generators.....do....	2,699,200	32.5	39.6	27.9
Water-wheel generators.....do....	10,785,900	81.9	.5	17.6
Total electric generating equipment kilowatts..	58,638,800	86.4	5.8	7.8
Hydraulic turbines.....horsepower..	15,498,600	90.0		10.0
Steam generators..pounds of steam per hour...	498,365,000	74.0	17.9	8.1
Power transformers.....kilovolt-amperes...	201,287,000	94.9		5.1

TABLE IV.—*Total electric generating capacity, thermal and hydraulic (4,000 kilowatts and larger)*

[Kilowatts]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	4,074,200	2,038,300	6,112,500	10,421,500	11,064,900	5,106,200	404,000	29,034,900	5,188,100	2,560,100
United States industrials	393,500	173,000	566,500	1,132,200	405,000	65,000	----------	1,775,200	406,500	270,500
Outside United States	945,900	465,500	1,411,400	627,400	365,700	170,000	----------	1,628,600	453,300	809,100
Total	5,413,600	2,676,800	8,090,400	12,181,100	11,835,600	5,341,200	404,000	32,438,700	6,047,900	3,639,700

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	1,514,100	5,056,500	6,570,600	10,367,100	8,987,700	1,781,000	214,600	26,406,900
United States industrials	123,000	553,500	676,500	945,700	140,000	----------	----------	1,639,200
Outside United States	136,800	1,332,800	1,469,600	486,400	135,200	30,000	----------	1,984,400
Total	1,773,900	6,942,800	8,716,700	11,799,200	9,262,900	1,811,000	214,600	30,030,500

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−458,100	+54,400	+2,077,200	+3,325,200	+189,400
United States industrials	−110,000	+186,500	+265,000	+65,000	----------
Outside United States	−58,200	+141,000	+230,500	+140,000	----------
Total	−626,300	+381,900	+2,572,700	+3,530,200	+189,400

LARGE STEAM TURBINE GENERATORS (10,000 KILOWATTS AND LARGER)

Scheduled production of large steam turbine generators for all classes of customers, as of October 1, 1951, totals 26,361,200 kilowatts against 24,050,500 kilowatts as of April 1, 1951, an increase of 2,310,700 kilowatts or 9.6 percent. The total of new capacity scheduled since April 1 is 4,993,200 kilowatts compared with shipments during the same period of 2,682,500 kilowatts.

For United States electric power systems, scheduled production as of October 1 is 24,007,200 kilowatts against 21,595,500 kilowatts as of April 1, an increase of 2,411,700 kilowatts or 11 percent. The total of new capacity scheduled since April 1 is 4,349,200 kilowatts compared with shipments during the same period of 1,937,500 kilowatts.

As of October 1, 1951, the total shipments scheduled for United States electric power systems in 1951 are 390,000 kilowatts less than shown in April. Production scheduled for 1952 is 20,800 kilowatts less than in April. The increase in scheduled production shown for 1953 and beyond reflects new orders placed since April 1.

As of October 1, total scheduled production for both 1952 and 1953 is at the limit of the present estimated full manufacturing capacity. Therefore, any further delays in production must necessarily affect the schedules over this entire period. It is also apparent that any further manufacturing time lost could not be recovered until sometime in 1954.

Manufacturers report that they are being allotted less material than actually required to maintain their schedules and that it has not been possible to obtain delivery of all materials allotted them. By utilizing normal working inventories, the slippage up to the present has been less than it would otherwise have been. Such inventories, however, have been exhausted and cannot be replaced. Production is thus severely retarded and brought to a hand-to-mouth basis.

TABLE V.—*Large steam turbine generators (10,000 kw. and larger)*

[Kilowatts]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	3,290,500	1,444,000	4,734,500	8,481,200	9,771,000	4,251,000	60,000	24,007,200	4,349,200	1,937,500
United States industrials	250,000	97,500	347,500	886,500	405,000	65,000	----------	1,454,000	384,000	145,000
Outside United States	600,000	270,000	870,000	210,000	250,000	170,000	----------	900,000	260,000	600,000
Total	4,140,500	1,811,500	5,952,000	9,577,700	10,426,000	4,486,000	60,000	26,361,200	4,993,200	2,682,500
Estimated open manufacturing capacity for production of additional generating units	----------	----------	----------	----------	200,000	5,500,000	10,000,000	----------	----------	----------

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	1,353,000	3,771,500	5,124,500	8,502,000	8,113,500	1,208,500	----------	21,595,500
United States industrials	105,000	325,000	430,000	750,000	140,000	----------	----------	1,215,000
Outside United States	----------	920,000	920,000	170,000	120,000	30,000	----------	1,240,000
Total	1,458,000	5,016,500	6,474,500	9,422,000	8,373,500	1,238,500	----------	24,050,500

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−390,000	−20,800	+1,657,500	+3,042,500	+60,000
United States industrials	−82,500	+136,500	+265,000	+65,000	
Outside United States	−50,000	+40,000	+130,000	+140,000	
Total	−522,500	+155,700	+2,052,500	+3,247,500	+60,000

The estimated open manufacturing capacity of 200,000 kilowatts shown for 1953 applies to units in the range of 10,000 to 15,000 kilowatts. Estimated open manufacturing capacity of 5,500,000 kilowatts shown for 1954 applies to a wider range of sizes, the larger machines being available mainly for shipment during the last half of the year.

These estimates are based upon the capacity of manufacturing facilities, assuming that all required materials would be readily available. The full manufacturing capacity for building large steam turbine generators expressed in terms of kilowatts of capacity per year is now estimated to be about 10,000,000 kilowatts. This capacity will vary depending upon the size and type of units involved, the proportions of duplicate designs, and other factors, such as the number of shifts employed and the extent of the workweek.

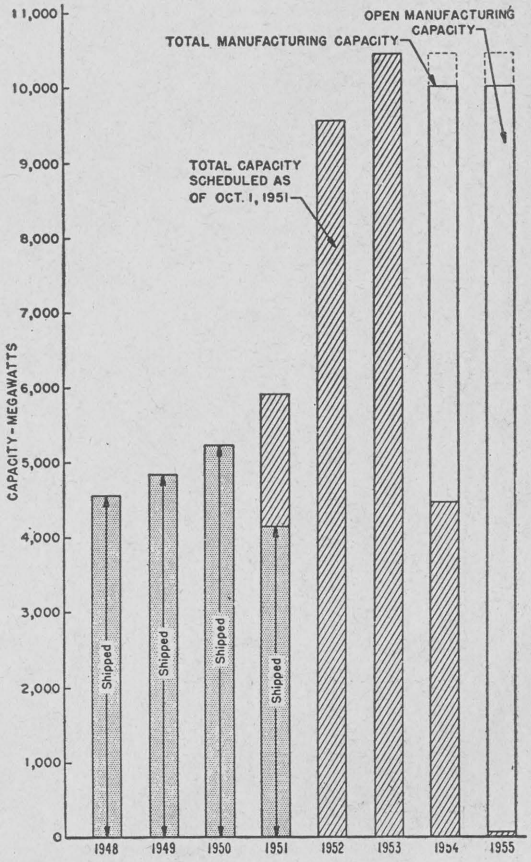


Fig. 4—Large Steam Turbine-Generators (10,000 Kw and Larger)

SMALL STEAM TURBINE GENERATORS (4,000 TO 9,999 KILOWATTS)

Scheduled production of small steam turbine generators for all classes of customers, as of October 1, 1951, is 695,000 kilowatts against 779,500 kilowatts as of April 1, 1951. The total capacity shipped since April 1 is 194,000 kilowatts, whereas new capacity scheduled during the same period totals 109,500 kilowatts.

As of October 1, 1951, the total shipments scheduled for United States electric power systems for 1951 are 148,500 kilowatts, compared with 163,500 kilowatts as of April, a loss of 15,000 kilowatts in 1951 production now rescheduled for 1952. The corresponding slippage of capacity for United States industrials is 27,500 kilowatts.

There is considerable manufacturing capacity for production of small steam turbine generators, but lack of materials has slowed their production the same as for other classes of equipment.

The estimated open manufacturing capacity of 250,000 kilowatts in 1952 is available for shipment of units during the last quarter of the year. Estimated full manufacturing capacity of 1,200,000 kilowatts is available in 1953 and beyond.

These estimates assume that all required materials would be obtainable as needed.

Combining this full manufacturing capacity with the estimated full manufacturing capacity for large steam turbine generators gives a total of 11,200,000 kilowatts per year as the potential capacity for the production of units 4,000 kilowatts and larger.

TABLE VI.—*Small steam turbine generators (4,000 to 9,999 kilowatts)*

[Kilowatts]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	88,500	60,000	148,500	90,000	7,500	----------	----------	157,500	24,500	47,500
United States industrials	143,500	75,500	219,000	219,500	----------	----------	----------	295,000	22,500	125,500
Outside United States	36,000	68,000	104,000	174,500	----------	----------	----------	242,500	62,500	21,000
Total	268,000	203,500	471,500	484,000	7,500	----------	----------	695,000	109,500	194,000
Estimated open manufacturing capacity for production of additional generating units	----------	----------	----------	250,000	1,200,000	1,200,000	1,200,000	----------	----------	----------

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	41,000	122,500	163,500	58,000	----------	----------	----------	180,500
United States industrials	18,000	228,500	246,500	169,500	----------	----------	----------	398,000
Outside United States	15,000	94,000	109,000	102,000	5,000	----------	----------	201,000
Total	74,000	445,000	519,000	329,500	5,000	----------	----------	779,500

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−15,000	+32,000	+7,500		
United States industrials	−27,500	+50,000			
Outside United States	−5,000	+72,500	−5,000		
Total	−47,500	+154,500	+2,500		

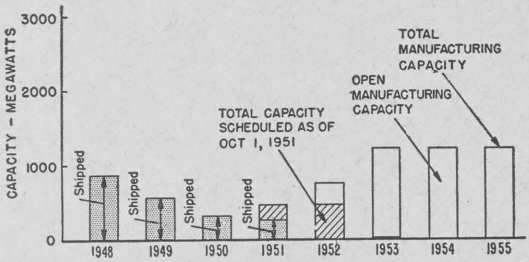


Fig. 5—Small Steam Turbine-Generators (4,000 to 9,999 Kw)

WATER-WHEEL GENERATORS (4,000 KILOWATTS AND LARGER)

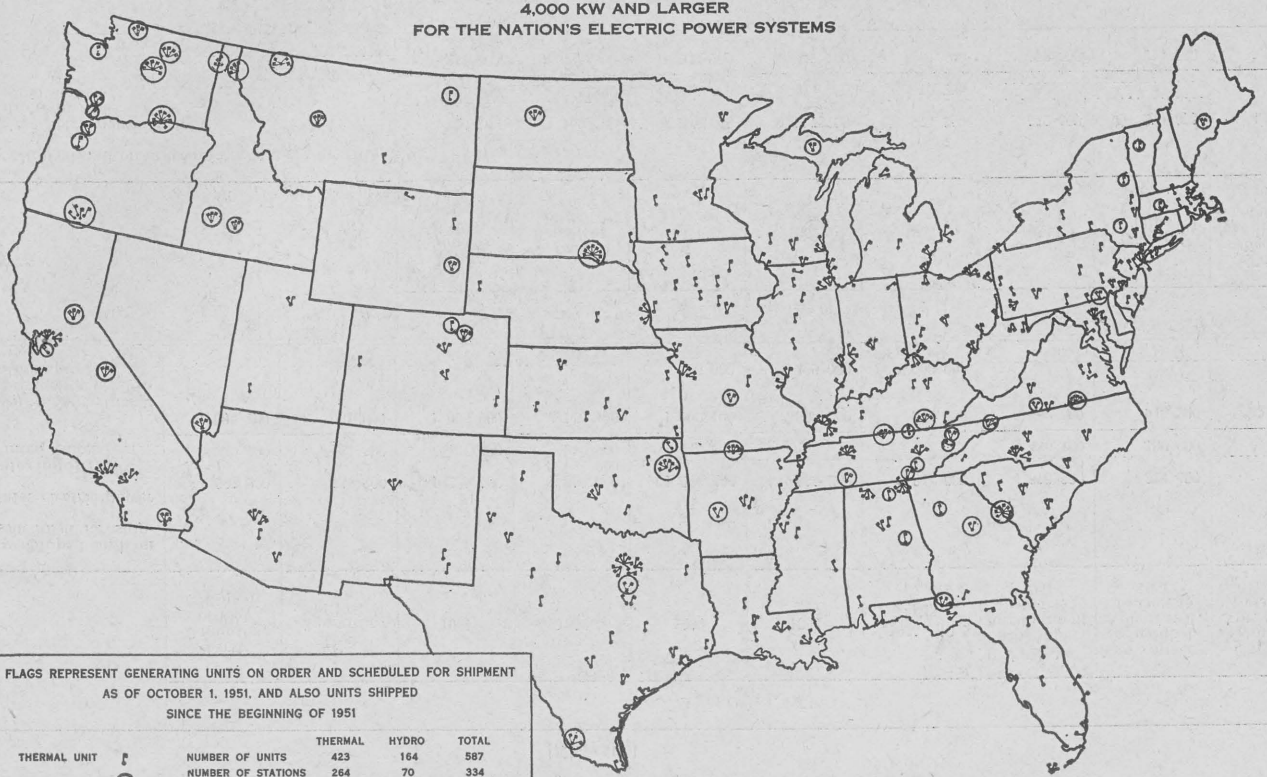
Scheduled production of water-wheel generators for all classes of customers, as of October 1, 1951, totals 5,382,500 kilowatts against 5,200,500 kilowatts as of April 1, 1951, an increase of 182,000 kilowatts. The total of new capacity scheduled since April 1 is 945,200 kilowatts, compared with shipments made during the same period of 763,200 kilowatts.

For United States electric power systems only, scheduled production, as of October 1, is 4,870,200 kilowatts against 4,630,900 kilowatts as of April 1, an increase of 239,300 kilowatts. The total new capacity scheduled since April 1 is 814,400 kilowatts, compared with shipments made during the same period of 575,100 kilowatts.

The figures in the accompanying table show that as of October 1, 53,100 kilowatts of capacity previously scheduled for shipment to United States electric power systems in 1951 has been rescheduled for 1952. Attention is also called to the fact that the total capacity for all classes of customers now scheduled for 1952—namely, 2,119,400 kilowatts—closely approaches the full manufacturing capacity, which is estimated as approximately 2,200,000 kilowatts annually with normal material supplies.

The estimated open manufacturing capacity of 800,000 kilowatts shown for 1953 increases to 1,400,000 kilowatts in 1954 and to 1,900,000 kilowatts in 1955.

MAP SHOWING LOCATION OF INSTALLATION OF NEW THERMAL AND HYDRAULIC GENERATING UNITS 4,000 KW AND LARGER FOR THE NATION'S ELECTRIC POWER SYSTEMS



FLAGS REPRESENT GENERATING UNITS ON ORDER AND SCHEDULED FOR SHIPMENT AS OF OCTOBER 1, 1951, AND ALSO UNITS SHIPPED SINCE THE BEGINNING OF 1951

THERMAL UNIT

HYDRO UNIT

	THERMAL	HYDRO	TOTAL
NUMBER OF UNITS	423	164	587
NUMBER OF STATIONS	264	70	334
TOTAL CAPACITY, KW	27,543,700	5,565,400	33,109,100

TABLE VII.—*Water-wheel generators (4,000 kilowatts and larger)*

[Kilowatts]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	695,200	534,300	1,229,500	1,850,300	1,286,400	855,200	344,000	4,870,200	814,400	575,100
United States industrials				26,200				26,200		
Outside United States	309,900	127,500	437,400	242,900	115,700			486,100	130,800	188,100
Total	1,005,100	661,800	1,666,900	2,119,400	1,402,100	855,200	344,000	5,382,500	945,200	763,200
Estimated open manufacturing capacity for production of additional generating units					800,000	1,400,000	1,900,000			

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	120,100	1,162,500	1,282,600	1,807,100	874,200	572,500	214,600	4,630,900
United States industrials				26,200				26,200
Outside United States	121,800	318,800	440,600	214,400	10,200			543,400
Total	241,900	1,481,300	1,723,200	2,047,700	884,400	572,500	214,600	5,200,500

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−53,100	+43,200	+412,200	+282,700	+129,400
United States industrials					
Outside United States	−3,200	+28,500	+105,500		
Total	−56,300	+71,700	+517,700	+282,700	+129,400

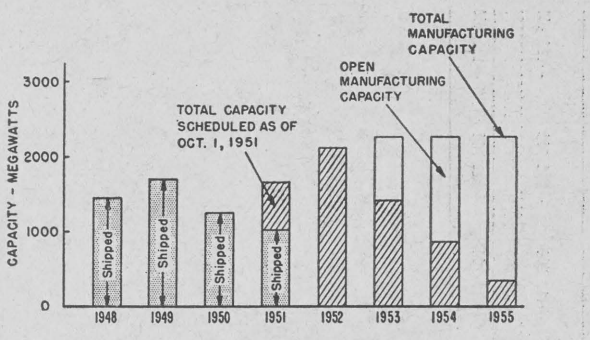


Fig. 6—Water-Wheel Generators (4,000 Kw and Larger)

STEAM GENERATORS (450 POUNDS PER SQUARE INCH PRESSURE AND HIGHER)

Scheduled production of steam generators for all classes of customers, as of October 1, 1951, is 22,011,000 pounds of steam per hour against 189,056,000 as of April 1, 1951, an increase of 32,955,000, or 17 percent. The total of new capacity scheduled since April 1 is 63,889,000 pounds of steam per hour, compared with shipments made during the same period of 30,934,000.

For United States electric power systems only, scheduled production as of October 1 is 172,492,000 pounds of steam per hour against 147,212,000 as of April 1, an increase of 25,280,000, or 17 percent.

The total of new capacity scheduled since April 1 is 44,990,000 pounds of steam per hour, compared with shipments made during the same period of 19,710,000. New capacity scheduled during this 6-month period, therefore, is 2.3 times the capacity shipped during the same period.

As of October 1, 1951, the total shipments scheduled for United States electric power systems in 1951 are 18,437,000 pounds of steam per hour less than shown as of April 1. Production scheduled for 1952 has increased by 28,855,000 pounds of steam per hour, including the slippage from 1951. In 1953 the increase is 33,622,000, and new capacity of 950,000 pounds of steam per hour has now been scheduled for 1954.

The estimated full manufacturing capacity for the four manufacturers who regularly participate in the surveys, and to which the above schedules apply, is

estimated as 150,000,000 pounds of steam per hour annually under conditions of normal material supplies. Thus, the total production of 150,454,000 pounds of steam per hour now scheduled for 1952 reaches this limit.

Attention is called to the fact that the capacity for United States electric power systems scheduled, as of October 1, for shipment during the last 3 months of 1951—namely, 16,863,000 pounds of steam per hour—would be at a rate almost double the average rate of shipments during the first 9 months of 1951. It appears more than likely, therefore, that additional capacity still scheduled for shipment in 1951 will have to be deferred until 1952.

Scheduled shipping dates of steam generators are expressed in terms of shipment of the drums, which are normally followed by shipments, during several subsequent months, of headers, tubes, superheaters, and other parts in the order required for field erection. Because of difficulties being encountered in obtaining materials of all kinds, there is no assurance that the shipment of drums can be followed by shipment of other parts in the normal manner. The probability is that completion of shipment will take longer under existing circumstances.

Manufacturers of steam generators have experienced great difficulties in obtaining required materials. Allotments have been less than requirements, but the major problem has been to obtain materials from the suppliers. As pointed out in the report of the April survey, tubes were particularly critical at that time. That situation was improved by action taken by the National Production Authoriy, but tubing is still reported to be in short supply.

Among the items which have caused the most serious delays during the past 6 months are drum plate, structural steel, and alloy tubing. Manufacturers report that, despite their best efforts to obtain required materials, the situation has grown progressively worse. Under the existing uncertain material procurement situation, production has been throttled much below that required to meet manufacturing schedules.

Estimated open manufacturing capacity of 100,000,000 pounds of steam per hour shown for 1953 is based upon the estimated capability of manufacturing facilities, assuming there would be no further slippage in existing scheduled production.

TABLE VIII.—*Steam generators (450 pounds per square inch pressure and higher)*

[Thousands of pounds of steam per hour]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	26,740	16,863	43,603	111,437	43,242	950	----------	172,492	44,990	19,710
United States industrials	9,291	8,063	17,354	29,146	----------	----------	----------	37,209	15,555	5,735
Outside United States	10,702	1,988	12,690	9,871	451	----------	----------	12,310	3,344	5,489
Total	46,733	26,914	73,647	150,454	43,693	950	----------	222,011	63,889	30,934
Estimated open manufacturing capacity for production of additional steam generators	----------	----------	----------	----------	100,000	150,000	150,000	----------	----------	----------

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	7,030	55,010	62,040	82,582	9,620	----------	----------	147,212
United States industrials	3,556	18,143	21,699	9,246	----------	----------	----------	27,389
Outside United States	5,213	10,904	16,117	3,551	----------	----------	----------	14,455
Total	15,799	84,057	99,856	95,379	9,620	----------	----------	189,056

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−18,437	+28,855	+33,622	+950	
United States industrials	−4,345	+19,900			
Outside United States	−3,427	+6,320	+451		
Total	−26,209	+55,075	+34,073	+950	

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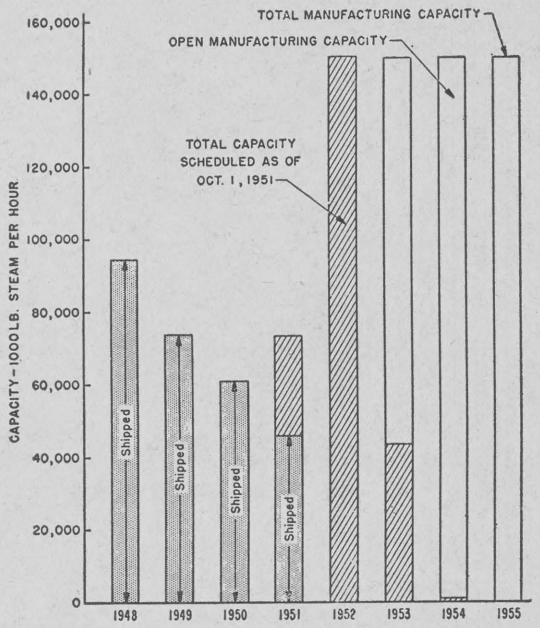

Fig. 7—Steam Generators (450-Psi Pressure and Higher)

HYDRAULIC TURBINES (5,000 HORSEPOWER AND LARGER)

Scheduled production of hydraulic turbines for all classes of customers, as of October 1, 1951, totals 7,995,700 horsepower against 7,120,100 horsepower as of April 1, 1951, an increase of 875,600 horsepower, or 12 percent. The total of new capacity scheduled since April 1 is 1,833,300 horsepower compared with shipments during the same period of 957,700 horsepower, a ratio of almost 2 to 1.

For United States electric power systems only, total scheduled production, as of October 1, is 7,328,600 horsepower against 6,576,700 horsepower as of April 1, an increase of 751,900 horsepower, or about 12 percent. The total of new capacity scheduled since April 1 is 1,640,800 horsepower, compared with 888,900 horsepower shipped during the same period.

Scheduled shipments for 1951 to United States electric power systems have dropped by 30,000 horsepower since April 1. During the same period scheduled shipments for 1951 for outside the United States have dropped by 83,600 horsepower.

Total shipments of hydraulic turbines during the first 9 months of 1951 were at the average rate of about 513,000 horsepower per quarter. Scheduled shipments for the last quarter of 1951 total 780,200 horsepower, or more than 50 percent greater than the average quarterly rate during the first three quarters of the year.

The yearly production schedules shown as of October 1 are well within the full manufacturing capacity, normally estimated as 4,500,000 horsepower annually. However, during recent months increased requirements for steel castings for other purposes have decreased that portion of the steel foundry capacity normally considered available for hydraulic turbine manufacture. Under these conditions the full capacity for building this equipment is less than normal.

The estimated open manufacturing capacity of 2,500,000 horsepower shown for 1953 increases to 3,000,000 horsepower in 1954 and to 3,500,000 horsepower in 1955.

TABLE IX.—*Hydraulic turbines (5,000 horsepower and larger)*

[Horsepower]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems	1,409,300	636,700	2,046,000	2,427,900	1,617,800	1,132,900	1,513,300	7,328,600	1,640,800	888,900
United States industrials				33,500				33,500		
Outside United States	128,800	143,500	272,300	400,700	89,400			633,600	192,500	68,800
Total	1,538,100	780,200	2,318,300	2,862,100	1,707,200	1,132,900	1,513,300	7,995,700	1,833,300	957,700
Estimated open manufacturing capacity for production of additional hydraulic turbines					2,500,000	3,000,000	3,500,000			

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems	520,400	1,555,600	2,076,000	2,395,400	685,300	960,400	980,000	6,576,700
United States industrials				33,500				33,500
Outside United States	60,000	295,900	355,900	214,000				509,900
Total	580,400	1,851,500	2,431,900	2,642,900	685,300	960,400	980,000	7,120,100

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems	−30,000	+32,500	+932,500	+172,500	+533,300
United States industrials					
Outside United States	−83,600	+186,700	+89,400		
Total	−113,600	+219,200	+1,021,900	+172,500	+533,300

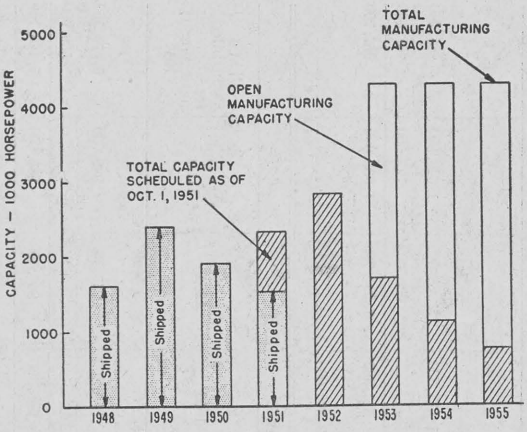

Fig. 8—Hydraulic Turbines (5,000 Horsepower and Larger)

POWER TRANSFORMERS (501 KILOVOLT-AMPERES AND LARGER)

Scheduled production of power transformers for all classes of customers, as of October 1, 1951, totals 86,914,000 kilovolt-amperes against 71,012,000 kilovolt-amperes as of April 1, 1951, an increase of 15,902,000 kilovolt-amperes, or 22 percent. The total of new capacity scheduled since April 1 is 34,116,000 kilovolt-amperes, compared with shipments during the same period of 18,214,000 kilovolt-amperes, a ratio of almost 2 to 1.

Total shipments now scheduled for 1951 are 3,117,000 kilovolt-amperes less than shown by the April 1 survey. The average rate of shipments during the first 9 months of 1951 was 8,900,000 kilovolt-amperes per quarter. Scheduled shipments for the last quarter of 1951 are shown as 11,429,000 kilovolt-amperes. Unless material supplies during the fourth quarter are substantially higher than during the previous quarters, it appears likely that there will be considerably more slippage in 1951 production than now indicated.

The present scheduled production for 1952 of 48,811,000 kilovolt-amperes is equivalent to the full estimated annual manufacturing capacity with normal material supplies. Under conditions as they have been during the past several months this higher production could not be accomplished. The scheduled production for 1952 as it now stands is 28 percent higher than that shown for 1951, which in all probability cannot be fully accomplished.

The estimated open manufacturing capacity of 20,000,000 kilovolt-amperes shown for 1953 increases to 45,000,000 kilovolt-amperes in 1954 on the basis of existing manufacturing facilities and normal material supplies.

The full manufacturing capacity for production of power transformers, previously estimated as 47,000,000 kilovolt-amperes per year, is now estimated as 49,000,000 to 50,000,000 kilovolt-amperes per year on the basis of the average increase in size of units presently on order.

TABLE X.—*Power transformers (501 kilovolt-amperes and larger)*

[Kilovolt-amperes]

	As of Oct. 1, 1951									
	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Oct. 1, 1951	New capacity scheduled Apr. 1, 1951, to Oct. 1, 1951	Capacity shipped Apr. 1, 1951, to Oct. 1, 1951
Total capacity shipped and on order and scheduled for shipment:										
United States electric power systems and United States industrials	24, 572, 000	10, 944, 000	35, 516, 000	46, 920, 000	23, 160, 000	2, 018, 000	----------	83, 042, 000	32, 114, 000	16, 392, 000
Outside United States	2, 126, 000	485, 000	2, 611, 000	1, 891, 000	1, 294, 000	202, 000	----------	3, 872, 000	2, 002, 000	1, 822, 000
Total	26, 698, 000	11, 429, 000	38, 127, 000	48, 811, 000	24, 454, 000	2, 220, 000	----------	86, 914, 000	34, 116, 000	18, 214, 000
Estimated open manufacturing capacity for production of additional power transformers	----------	----------	----------	----------	20, 000, 000	45, 000, 000	50, 000, 000	----------	----------	----------

	As of Apr. 1, 1951							
	First 3 months of 1951 (shipped)	Last 9 months of 1951	1951	1952	1953	1954	1955 and later	Total scheduled for shipment as of Apr. 1, 1951
Total capacity shipped and on order and scheduled for shipment:								
United States electric power systems and United States industrials	8, 180, 000	30, 453, 000	38, 633, 000	29, 399, 000	6, 652, 000	816, 000	----------	67, 320, 000
Outside United States	304, 000	2, 307, 000	2, 611, 000	1, 292, 000	65, 000	28, 000	----------	3, 692, 000
Total	8, 484, 000	32, 760, 000	41, 244, 000	30, 691, 000	6, 717, 000	844, 000	----------	71, 012, 000

CHANGE IN SCHEDULE BETWEEN APRIL AND OCTOBER

	1951	1952	1953	1954	1955 and later
Total capacity shipped and on order and scheduled for shipment:					
United States electric power systems and United States industrials	−3, 117, 000	+17, 521, 000	+16, 508, 000	+1, 202, 000	----------
Outside United States	----------	+599, 000	+1, 229, 000	+174, 000	----------
Total	−3, 117, 000	+18, 120, 000	+17, 737, 000	+1, 376, 000	----------

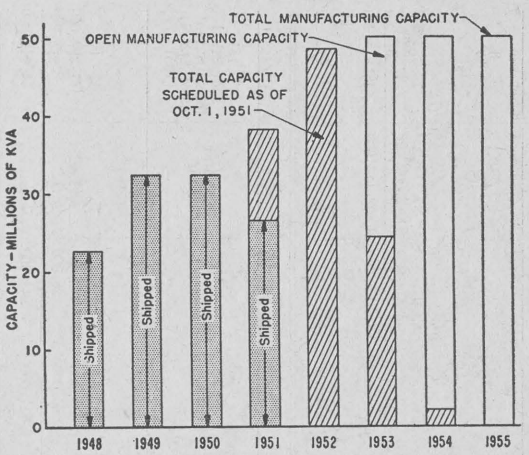

Fig. 9—Power Transformers (501 Kva and Larger)

SUMMARY OF EQUIPMENT MANUFACTURE

The full manufacturing capacity for building large steam turbine generators of the sizes represented by present orders is approximately 10,000,000 kilowatts per year, on the basis that necessary materials are available as needed to carry out production processes according to shop schedules. The scheduled production for 1952 and 1953 now stands at approximately that level. Unless full material supplies are forthcoming without delays, the actual production for those years may be expected to be less by the amount that available materials fall short of the full requirements.

The full manufacturing capacity for building steam turbine generators in sizes 4,000 to 9,999 kilowatts is estimated as 1,200,000 kilowatts per year. Demands for units in this size range are considerably below the potential manufacturing capacity, but lack of materials has already reduced the 1951 production, scheduled as of April 1, by almost 10 percent.

For water-wheel generators, the full manufacturing capacity, under conditions of full material supplies, is estimated as 2,200,000 kilowatts per year. Expected production in 1951, according to schedules as of October 1, will total about 75 percent of this amount. For 1952 the scheduled production is approximately equal to the full manufacturing capacity.

For both types of electric generating equipment—thermal and hydraulic—in sizes 4,000 kilowatts and larger, the estimated full manufacturing capacity is 13,400,000 kilowatts.

Existing manufacturing facilities for the production of steam generators are estimated as capable of producing a capacity of 150,000,000 pounds of steam per hour annually or more. As of April 1, 1951, the scheduled production for the year was approximately 100,000,000 pounds of steam per hour, or two-thirds of the potential manufacturing capacity. However, material procurement problems up to October 1 have reduced the indicated production for 1951 to 73,647,000 pounds of steam per hour, or about 73 percent of the total capacity scheduled 6 months previously, and the probability is that further loss of 1951 production will occur before the end of the year. Thus, the actual production for the year will be less than half the production of which the manufacturers are capable.

For 1952 the total scheduled production, as of October 1, 1951, is 150,454,000 pounds of steam per hour. With the inability in 1951 to ship even half that amount, it is difficult to understand how the scheduled 1952 production could be even approached unless there is a great change in the existing material supply situation. Indicated delays in the deliveries of steam generators because of lack of materials is by far the most serious problem faced by the electric power systems. The situation requires immediate attention and positive action to avoid serious disruption to the thermal electric power projects.

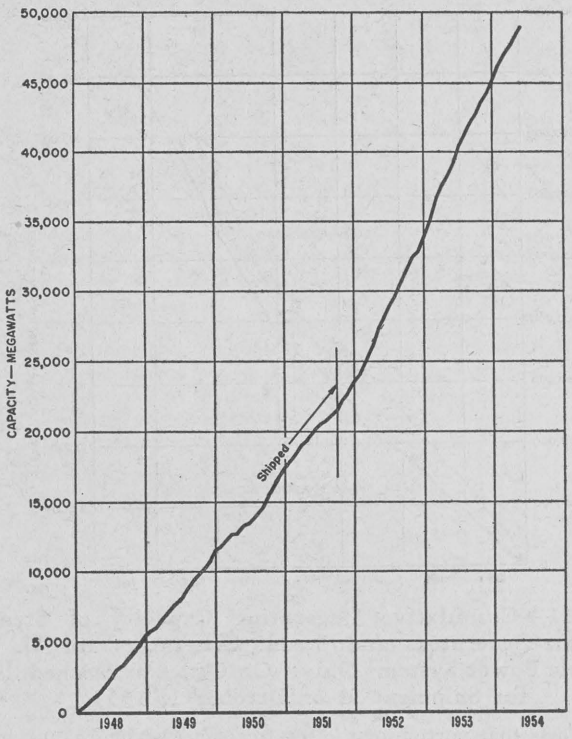

Fig. 10—Cumulative Generating Capacity of Steam Turbine-Generators and Water-Wheel Generators for U. S. Electric Power Systems Only—On Order and Scheduled for Shipment as of October 1, 1951

The capacity for manufacture of hydraulic turbines is ample to meet present scheduled production. The indicated loss in 1951 production resulting from material procurement difficulties is less than 5 percent. Scheduled production for 1952 is about 23 percent higher than the expected 1951 production.

The full manufacturing capacity for production of power transformers is estimated as about 49,000,000 to 50,000,000 kilovolt-amperes per year with assured material supplies. However, lack of materials has reduced the presently indicated production for 1951 by more than 3,000,000 kilovolt-amperes under that scheduled as of April 1. By the end of 1951 it is estimated that the production for the year will be about 5,000,000 kilovolt-amperes less than the schedule as of April 1. On this basis, the 1951 production would be equivalent to less than 75 percent of the estimated full manufacturing capacity.

The 1952 scheduled production presently stands at almost 49,000,000 kilovolt-amperes, or about at the limit of the estimated productive capacity. Without greatly increased material supplies the actual production in 1952 must fall far below that scheduled.

Capacity for United States electric power systems

The rate at which electric power generating capacity—thermal and hydraulic—for United States electric power systems has been shipped and is scheduled for shipment, as of October 1, 1951, beginning with the year 1948, is shown in figure 10. The average rate during the period up to October 1, 1951, is 5,800,000 kilowatts per year. The average rate from October 1, 1951, through 1953 is 10,500,000 kilowatts per year, on the basis of present production schedules. Failure to attain this latter rate will result from material shortages, as manufacturing facilities are capable of that rate of production.

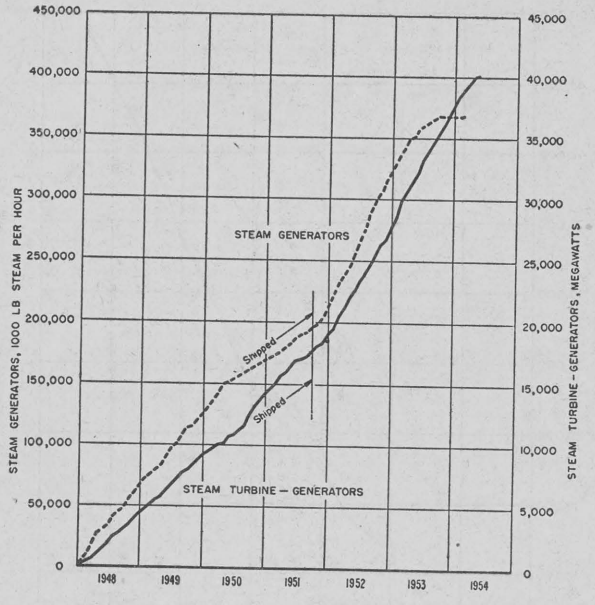

Fig. 11—Cumulative Generating Capacity of Steam Turbine-Generators and Steam Generators for U. S. Electric Power Systems Only—On Order and Scheduled for Shipment as of October 1, 1951

Figure 11 shows that portion of the total capacity of figure 10 represented by steam turbine generators. Also included in figure 11 is a dotted curve showing the cumulative capacity of steam generators shipped and scheduled to be shipped to United States electric power systems.

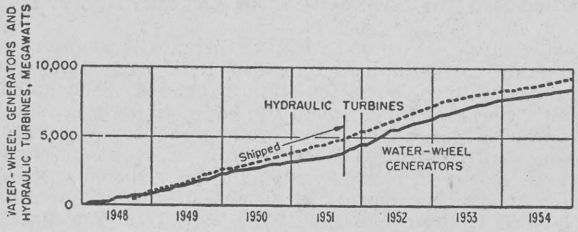

Fig. 12—Cumulative Generating Capacity of Water-Wheel Generators and Hydraulic Turbines for U. S. Electric Power Systems Only—On Order and Scheduled for Shipment as of October 1, 1951

Figure 12 is similar to figure 11 but relates to water-wheel generators and hydraulic turbines. For the purpose of this illustration, the horsepower capacity of the hydraulic turbines has been shown in terms of equivalent kilowatts in order that the two curves be directly comparable.

Material and manpower

Manufacturers report that material procurement has become progressively more difficult during the past several months. Although the introduction of the controlled materials plan (CMP) in the third quarter of 1951 was expected to improve matters, experience thus far has not borne out the expectation. The

equipment manufacturers, particularly the producers of steam generators, have been able to obtain only a part of the materials allotted to them. Steel suppliers have rejected orders on the grounds that their schedules were already full. The experience of the electric power systems, or their contractors, in ordering allotted steel for plant construction has been similar.

Thus far, manpower required for equipment production has not been a serious problem. On the contrary, some manufacturers are concerned with the problem that lack of materials has shortened the hours of work to the point where skilled labor and production forces are being attracted to other industries offering full work schedules.

Engineering and technical personnel continue to be scarce, and these forces are carrying a heavy burden.

Employee and management relations, in general are reasonably satisfactory, although there have been some difficulties during the past 6 months which have resulted in some loss of production.

The only real problem at this time is materials. This presents a situation the consequences of which may be more far reaching than is apparent at present.

TABLE XI.—*Total electric generating capacity, thermal and hydraulic, shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Kilowatt capacity—units of 4,000 kilowatts and larger]

Regions [1]	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 month of 1951	1951	1952	1953	1954	1955 and later
I	1,318,500	584,600	1,185,600	613,900	248,500	862,400	1,682,600	2,065,000	720,300	40,000
II	922,500	1,276,500	875,000	740,000	280,000	1,020,000	1,742,500	1,536,000	941,000	----------
III	616,800	885,000	831,300	1,001,300	646,100	1,647,400	2,659,400	2,626,400	1,335,400	----------
IV	491,500	1,067,500	641,700	570,000	130,500	700,500	1,204,100	1,072,500	540,000	----------
V	590,000	629,200	1,024,500	265,000	267,500	532,500	1,280,000	1,368,000	597,500	60,000
VI	254,000	312,300	207,500	345,000	80,000	425,000	274,700	484,500	238,000	240,000
VII	366,500	736,700	520,600	229,500	188,200	417,700	945,200	500,500	514,000	64,000
VIII	816,900	665,700	734,500	309,500	197,500	507,000	633,000	1,412,000	220,000	----------
United States electric power systems	5,376,700	6,157,500	6,020,700	4,074,200	2,038,300	6,112,500	10,421,500	11,064,900	5,106,200	404,006
United States industrials	577,500	425,000	211,000	393,500	173,000	566,500	1,132,200	405,000	65,000	----------
Outside United States	922,400	538,900	556,800	945,900	465,500	1,411,400	627,400	365,700	170,000	----------
Total	6,876,600	7,121,400	6,788,500	5,413,600	2,676,800	8,090,400	12,181,100	11,835,600	5,341,200	404,000

[1] Approximately as defined by Federal Power Commission.

TABLE XII.—*Large steam turbine generators shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Kilowatt capacity—units of 10,000 kilowatts and larger]

Regions [1]	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
I	1,267,500	530,000	1,125,000	555,000	205,000	760,000	1,620,000	2,020,000	685,000	----------
II	900,000	1,271,500	875,000	715,000	265,000	980,000	1,742,500	1,536,000	941,000	----------
III	435,500	545,000	665,000	697,500	457,500	1,155,000	2,148,000	2,265,000	1,245,000	----------
IV	427,500	918,000	572,000	550,000	121,500	671,500	1,141,500	1,065,000	540,000	----------
V	464,000	582,500	905,000	238,000	215,000	453,000	1,022,700	1,320,000	560,000	60,000
VI	200,000	194,000	161,500	285,000	70,000	355,000	146,500	315,000	60,000	----------
VII	----------	51,500	----------	120,000	----------	120,000	60,000	----------	----------	----------
VIII	581,500	439,000	550,000	130,000	110,000	240,000	600,000	1,250,000	220,000	----------
United States electric power systems	4,276,000	4,531,500	4,853,500	3,290,500	1,444,000	4,734,500	8,481,200	9,771,000	4,251,000	60,000
United States industrials	170,000	252,500	130,000	250,000	97,500	347,500	886,500	405,000	65,000	----------
Outside United States	112,500	82,500	243,500	600,000	270,000	870,000	210,000	250,000	170,000	----------
Total	4,558,500	4,866,500	5,227,000	4,140,500	1,811,500	5,952,000	9,577,700	10,426,000	4,486,000	60,000

[1] Approximately as defined by Federal Power Commission.

TABLE XIII.—*Small turbine generators shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Kilowatt capacity—units of 4,000 to 9,999 kilowatts]

Regions [1]	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
I	12,500	24,000	22,500	7,500	13,500	21,000	30,000			
II	22,500	5,000		11,000	15,000	26,000				
III	25,000	6,000	25,000	12,500		12,500	22,500			
IV	64,000	62,000	37,500	20,000	9,000	29,000	10,000	7,500		
V	56,000	18,500	34,500	12,500	12,500	25,000	7,500			
VI	31,500	53,500	31,000	25,000	10,000	35,000	15,000			
VII		7,500					5,000			
VIII	33,000	30,000	30,000							
United States electric power systems	244,500	206,500	180,500	88,500	60,000	148,500	90,000	7,500		
United States industrials	407,500	142,500	81,000	143,500	75,500	219,000	219,500			
Outside United States	225,500	204,500	43,700	36,000	68,000	104,000	174,500			
Total	877,500	553,500	305,200	268,000	203,500	471,500	484,000	7,500		

[1] Approximately as defined by Federal Power Commission.

TABLE XIV.—*Water-wheel generators shipped and on order, scheduled for shipment as of October 1, 1951*

[Kilowatt capacity—units of 4,000 kilowatts and larger]

Regions [1]	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
I	38,500	30,600	38,100	51,400	30,000	81,400	32,600	45,000	35,300	40,000
II				14,000		14,000				
III	156,300	334,000	141,300	291,300	188,600	479,900	488,900	361,400	90,400	
IV		87,500	32,200				52,600			
V	70,000	28,200	85,000	14,500	40,000	54,500	249,800	48,000	37,500	
VI	22,500	64,800	15,000	35,000		35,000	113,200	169,500	178,000	240,000
VII	366,500	677,800	520,600	109,500	188,200	297,700	880,200	500,500	514,000	64,000
VIII	202,500	196,600	154,500	179,500	87,500	267,000	33,000	162,000		
United States electric power systems	856,300	1,419,500	986,700	695,200	534,300	1,229,500	1,850,300	1,286,400	855,200	344,000
United States industrials		30,000					26,200			
Outside United States	584,300	251,900	269,600	309,900	127,500	437,400	242,900	115,700		
Total	1,440,600	1,701,400	1,256,300	1,005,100	661,800	1,666,900	2,119,400	1,402,100	855,200	344,000

[1] Approximately as defined by Federal Power Commission.

TABLE XV.—*Steam generators shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Capacity, thousands of pounds of steam per hour—units 450 pounds per square inch pressure and higher]

	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
United States electric power systems	67,948	57,643	44,123	26,740	16,863	43,603	111,437	43,242	950	----
United States industrials	20,697	11,566	10,328	9,291	8,063	17,354	29,146	----	----	----
Outside United States	5,920	4,750	6,646	10,702	1,988	12,690	9,871	451	----	----
Total	94,565	73,959	61,097	46,733	26,914	73,647	150,454	43,693	950	----

TABLE XVI.—*Hydraulic turbines shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Horsepower—units of 5,000 horsepower and larger]

	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
United States electric power systems and United States industrials	1,373,200	2,074,700	1,734,000	1,409,300	636,700	2,046,000	2,461,400	1,617,800	1,132,900	1,513,300
Outside United States	246,200	330,200	206,700	128,800	143,500	272,300	400,700	89,400	----	----
Total	1,619,400	2,404,900	1,940,700	1,538,100	780,200	2,318,300	2,862,100	1,707,200	1,132,900	1,513,300

TABLE XVII.—*Power transformers shipped and on order, scheduled for shipment as of Oct. 1, 1951*

[Kilovolt-ampers capacity—units of 501 kilovolt-amperes and larger]

	1948 (shipped)	1949 (shipped)	1950 (shipped)	First 9 months of 1951 (shipped)	Last 3 months of 1951	1951	1952	1953	1954	1955 and later
United States electric power systems and United States industrials	21,643,000	30,918,000	30,842,000	24,572,000	10,944,000	35,516,000	46,920,000	23,160,000	2,018,000	----------
Outside United States	1,221,000	1,603,000	1,448,000	2,126,000	485,000	2,611,000	1,891,000	1,294,000	202,000	----------
Total	22,864,000	32,521,000	32,290,000	26,698,000	11,429,000	38,127,000	48,811,000	24,454,000	2,220,000	----------